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THE PATHOLOGICAL UTERUS AT THE MENOPAUSE. By CHARLES R. ROBINS, M.D. . 313

A CONTRIBUTION TO THE NATURE OF THE MONONUCLEAR CELLS SEEN IN THE EXUDATE OF LOBAR PNEUMONIA ACCOMPANYING TYPHOID FEVER. By JONATHAN FORMAN, M.D., and C. CLARON HUGGER, M.D. 317

UNSUSPECTED SYPHILIS. By JAMES S. McLESTER, M.D., MAJOR, M.R.C. 320

SPIRAL FRACTURES OF THE TIBIA. By CHARLES DAVISON, M.D. 323

ACHYLIA GASTRICA AND CHRONIC CONNECTIVE-TISSUE LIENTERY: A CLINICAL STUDY OF 322 CASES. By NOBLE WILLIAMS JONES, M.D. 335

DIGITALIS AND THE CONTROL OF AURICULAR FIBRILLATION AND AURICULAR FLUTTER, WITH ELECTROCARDIOGRAMS ILLUSTRATING THE EFFECT. By ROBERT H. HALSEY, A.B., M.A., M.D. 344

SYPHILIS OF THE LUNG. By H. LISSER, A.B., M.D. 356

THREE CASES OF INFECTION OF THE UPPER RESPIRATORY TRACT WITH STAPHYLOCOCCUS PYOGENES AUREUS, PRESENTING THE SYMPTOM-COMPLEX OF ACIDOSIS. By L. U. GARDNER, M.D. 380

URINARY INFECTIONS OF PREGNANCY AND THE PUERPERIUM. By F. H. SMITH, M.D. 392

A SIMPLE PROCEDURE FOR PREPARATION OF COLLOIDAL GOLD FOR DIAGNOSTIC PURPOSES. By O. I. LEE, B.S. 404

THE PRESENT STATUS OF HODGKIN'S DISEASE. By ARTHUR F. BEIFELD, M.D. . . 409

ASTHMA CONSIDERED IN ITS RELATIONSHIP TO THE VEGETATIVE NERVOUS SYSTEM. By FRANCIS M. POTTENGER, A.M., M.D., LL.D. 417

WAR MEDICINE

War Neuroses and Psychoses.

Organization and Activities of the American Red Cross Bureau of Sanitary Service.

(Contents continued on page vi)

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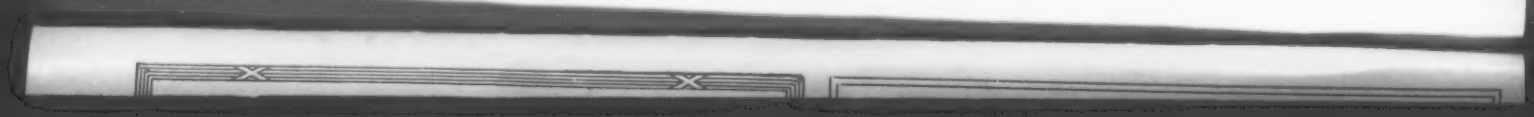

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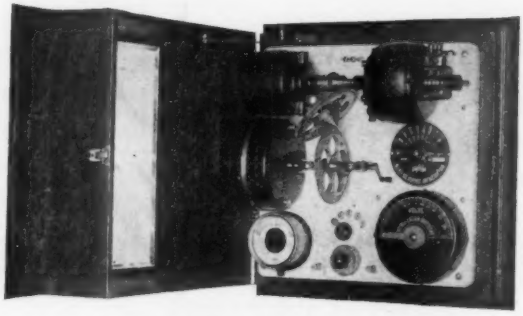

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CONTENTS

ORIGINAL ARTICLES

The Pathological Uterus at the Menopause 313

By Charles R. Robins, M.D., Professor of Gynecology, Medical College of Virginia; Surgeon to Stuart Circle Hospital and Gynecologist to Memorial Hospital, Richmond, Virginia.

A Contribution to the Nature of the Mononuclear Cells Seen in the Exudate of Lobar Pneumonia Accompanying Typhoid Fever . . 317

By Jonathan Forman, M.D., and C. Claron Hugger, M.D., Columbus, Ohio.

Unsuspected Syphilis: A Statistical Study 320

By James S. McLester, M.D., Major, M. R. C., Professor of Medicine, Graduate School of Medicine of the University of Alabama, Birmingham, and Physician-in-Chief to the Hospital.

Spiral Fractures of the Tibia 323

By Charles Davison, M.D., Chicago.

Achylia Gastrica and Chronic Connective-tissue Lientery: a Clinical Study of 322 Cases 335

By Noble Wiley Jones, M.D., Portland, Oregon.

Digitalis and the Control of Auricular Fibrillation and Auricular Flutter, with Electrocardiograms Illustrating the Effect 344

By Robert H. Halsey, A.B., M.A., M.D., New York.

Syphilis of the Lung 356

By H. Lisser, A.B., M.D., Instructor in Medicine, San Francisco.

Three Cases of Infection of the Upper Respiratory Tract with Staphylococcus Pyogenes Aureus, Presenting the Symptom-complex of Acidosis 380

By L. U. Gardner, M.D., Boston.

Urinary Infections of Pregnancy and the Puerperium 392

By F. H. Smith, M.D., Abingdon, Virginia.

(Contents continued on page 8)

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CONTENTS—(*Continued*)

A Simple Procedure for Preparation of Colloidal Gold for Diagnostic Purposes 404
By O. I. Lee, B.S., New York.

The Present Status of Hodgkin's Disease 409
By Arthur F. Beifeld, M.D., Chicago.

Asthma Considered in its Relationship to the Vegetative Nervous System 417
By Francis M. Pottenger, A.M., M.D., LL.D., Monrovia, California.

WAR MEDICINE

War Neuroses and Psychoses. (By Clarence B. Farrar, Capt., C. A. M. C., Psychiatrist to the Military Hospitals Commission of Canada) 425
Organization and Activities of the American Red Cross Bureau of Sanitary Service 437

REVIEWS

Diseases of the Nervous System. By Smith Ely Jelliffe, M.D., Ph.D., and William A. White, M.D. 443
Modern Dietetics. By Lulu Graves 444
A Manual of Anatomy. By Henry Erdmann Radasch, M.Sc., M.D. . 444
Collected Papers of the Mayo Clinic, Rochester, Minn. 445
Erfahrungen über Diagnostik und Klinik der Herzklappenfehler. By Professor S. E. Henschen 446
A Chemical Sign of Life. By Shiro Tashiro 446
The Principles of Gynecology. By W. Blair Bell, B.S., M.D. (Lond.) . 447
Three Contributions to the Theory of Sex. By Prof. Sigmund Freud . 448
Diseases of Women. By Harry Sturgeon Crossen, M.D., F.A.C.S. . . 448
A Manual of Nervous Diseases. By Irving J. Spear, M.D. 449
Infected Wounds. By A. Carrel and G. Dehelly 450
The History of the Psycho-analytic Movement. By Prof. Dr. Sigmund Freud 450

(*Contents continued on page 10*)

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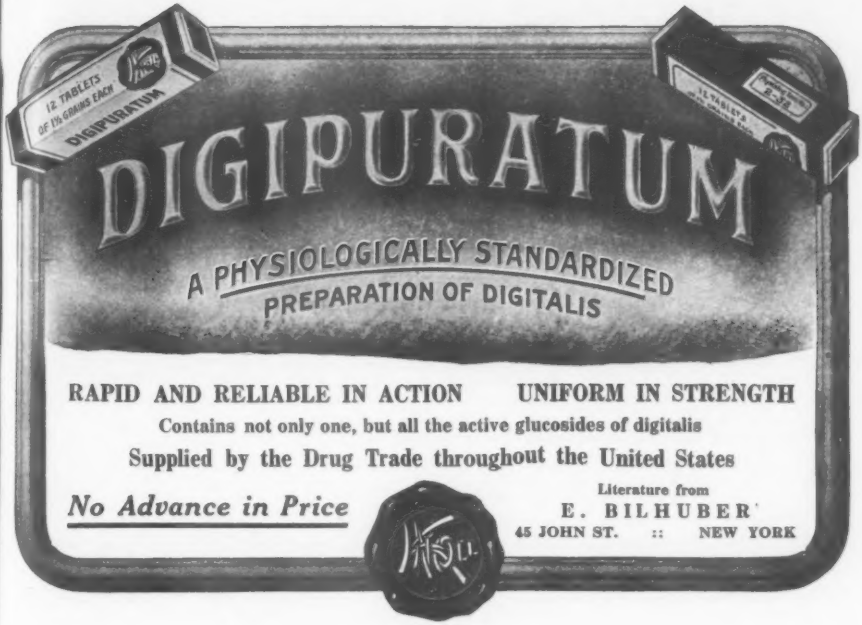
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CONTENTS—(*Continued*)

PROGRESS OF MEDICAL SCIENCE

SURGERY

UNDER THE CHARGE OF

T. TURNER THOMAS, M.D.

Course and Treatment of Joint Suppurations; the Technic of Making the Drainage Opening 451

Treatment of Open Pneumothorax by Immediate Suture of the Thoracic Wall 452

Observations on the Relation of Acidosis to Anesthesia 452

THERAPEUTICS

UNDER THE CHARGE OF

SAMUEL W. LAMBERT, M.D.

The Use of Foreign Protein in the Treatment of Arthritis 453

PEDIATRICS

UNDER THE CHARGE OF

THOMPSON S. WESTCOTT, M.D., AND ALVIN E. SIEGEL, M.D.

The Intraperitoneal Injection of Saline Solution 455

Studies of Acid Production 455

The Skin and Throat Manifestations of Heine-Medin's Disease . . . 456

(*Contents continued on page 12*)

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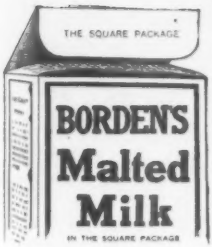

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CONTENTS—(*Continued*)

PROGRESS OF MEDICAL SCIENCE

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Course and Treatment of Joint Suppurations; the Technic of Making the Drainage Opening 451

Treatment of Open Pneumothorax by Immediate Suture of the Thoracic Wall 452

Observations on the Relation of Acidosis to Anesthesia 452

THERAPEUTICS

UNDER THE CHARGE OF

SAMUEL W. LAMBERT, M.D.

The Use of Foreign Protein in the Treatment of Arthritis 453

PEDIATRICS

UNDER THE CHARGE OF

THOMPSON S. WESTCOTT, M.D., AND ALVIN E. SIEGEL, M.D.

The Intraperitoneal Injection of Saline Solution 455

Studies of Acid Production 455

The Skin and Throat Manifestations of Heine-Medin's Disease . . . 456

(*Contents continued on page 12*)

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CONTENTS—*(Continued)*

OBSTETRICS

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.

Pregnancy following Extensive Operation upon the Tube and Ovary, with Removal of the Appendix 457

Osteomalacia 457

Pregnancy Complicated by Cancer of the Cervix 458

Bichloride of Mercury Poisoning from the Insertion of a Tablet within the Vagina 458

T :n Pregnancy in a Horn of a Bicornute Uterus 459

The Operative Treatment for Stenosis of the Pylorus in Infants 459

The Umbilical Cord as a Factor in Infant Mortality 460

GYNECOLOGY

UNDER THE CHARGE OF

JOHN G. CLARK, M.D.

Results of Radium Treatment in Cancer 461

(Contents continued on page 14)

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OSKAR KLOTZ, M.D., C.M.

Reaction of the Spleen in Acute Infections 462
The Oxidizing Ferment of the Myelocyte Series of Cells and its Demonstration by an Alphanaphthol-pyronin Method 463
The Etiology of Scarlet Fever 464
Primary Carcinoma of the Ureter 464
Experimental Typhoid Cholecystitis with Cholelithiasis 465

HYGIENE AND PUBLIC HEALTH

UNDER THE CHARGE OF

MILTON J. ROSENAU, M.D., AND GEORGE W. McCOY, M.D.

Health of Food Handlers 466
Experiences with the Louse Nuisance 467
Present Status of Birth Registration in American Cities and its Relation to the Infant Mortality Rate 468

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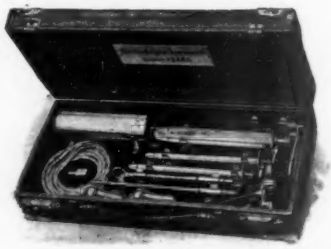

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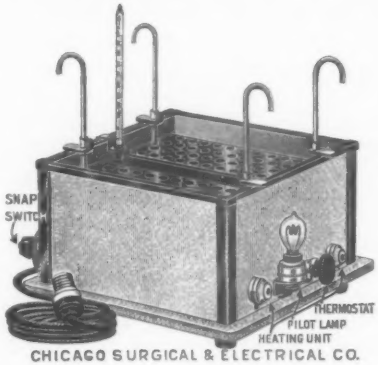

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*Bloom, New Orleans Medical and Surg. Journal, Vol. 70, No. 3, Sept. 1917, page 282.

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AMERICAN JOURNAL

OF THE MEDICAL SCIENCES

MARCH, 1918

ORIGINAL ARTICLES

THE PATHOLOGICAL UTERUS AT THE MENOPAUSE.

By Charles R. Robins, M.D.,

PROFESSOR OF GYNECOLOGY, MEDICAL COLLEGE OF VIRGINIA; SURGEON TO STUART CIRCLE HOSPITAL, AND GYNECOLOGIST TO MEMORIAL HOSPITAL, RICHMOND, VA.

In looking over a series of cases recently in which I performed the operation of hysterectomy, I find that 58 occurred in women who were forty years old and over, and in all of these the complete removal of the uterus and adnexa had been practised. In 28 of these the operation was performed for fibroids, pelvic inflammation and other conditions in which the impossibility of conserving the organs was manifest and beyond dispute. In the remaining 30 cancer was either a positive or a possible diagnosis. In 4 a positive diagnosis of cancer of the cervix, afterward confirmed by the microscope, was made and a Wertheim operation, preceded by cauterization with the Percy cautery, was done. In 26 a diagnosis of chronic metritis, including in this induration of the cervix, was made and a possibility of malignancy considered. In practically all of these bleeding from the uterus was a prominent symptom, manifesting itself as irregular or continuous bleeding, and sometimes accompanied by marked anemia. In 2 cancer of the fundus was found on opening up the uterus.

In attempting to arrive at the diagnosis of cancer of the uterus we are often met with great difficulties when the case is in its incipiency and therefore presenting the best hope from an operation. In advanced cases, with marked symptomatology and gross pathological involvement, the question of diagnosis does not present itself, it is obvious, and with these cases we are not concerned at this time.

Usually when the cancer is situated on the vaginal aspect of the cervix it can be diagnosed in its earliest stages by physical examination, but in cases originating in the cervical canal or the fundus an early diagnosis without the microscope must remain a conjecture.

If we consider the symptoms associated with cancer which we could reasonably look upon as danger signals we are painfully impressed with their uncertainty and irregularity. The most commonly accepted and most reliable is an atypical bleeding. This may manifest itself as a slight show following some form of trauma, as coition or straining at stool, a bleeding between periods or excessive bleeding at periods or a bleeding returning after the menopause. The principle point in all of these is the development of a bleeding which has not previously existed and which does not present an obvious etiology. However, we can recall cases in which the most careful questioning failed to elicit a history of any type of bleeding in the early stages of the disease, and the first symptoms were those of pain from extension of the disease into the parametrial tissues. Still further uncertainty is produced by the fact that such symptoms may be occasioned by other conditions than cancer, particularly hyperplastic endometritis, which frequently springs up about the time of the menopause, and the development of a small fibroid polypus in the fundus. The indurated and enlarged cervix of chronic cervicitis also is quite difficult to diagnose from the induration and reaction present in cancer of the cervical canal. In addition to this it is now being generally admitted that any pathology of the cervix or fundus may be regarded as a precancerous condition and that the transition into malignancy may be so insidious as to present no special symptomatology until carcinoma is well advanced. In fibroids, for instance, we may have malignancy engrafted when an examination may show only the benign condition, which apparently fully accounts for the symptomatology present. It would thus appear, and is generally conceded, that unless the growth comes under the eye or direct touch that it is practically impossible to accurately diagnose a beginning malignant condition, and even then a microscopic examination may be necessary.

For the purpose of securing tissue for microscopic examination we have recourse to two methods, curettement when the growth is suspected in the body of the uterus and excision of a portion of the cervix when it is suspected. Both of these are open to serious objections. A curettement must be complete in order to be conclusive, and unfortunately it is often not as complete as we think it is, so that it is possible to secure a negative report even when the cancer is present. Excision of a portion of the cervix is open to the same objection, that we might not get just exactly the tissue that is involved. Again, in both of these cases, if satisfactory work is done, anesthesia is necessary, which unless frozen section is used means a second anesthesia. But above all I am convinced that cutting into cancer at all is bad technic and undoubtedly causes invasion of sound

tissue by cancer cells. This is particularly true if an appreciable time elapses before the final operation is done. This is obviated to some extent by the use of frozen section with immediate operation, but even then I believe that it is dangerous. How many minutes or how many days it takes for these cells to invade we have no means of ascertaining.

It has been suggested that in view of the uncertainties of diagnosis by means of curettement and excision of tissue that the cervix should be amputated and the uterus opened through an abdominal opening for complete examination and inspection. While this would make the diagnosis much more exact it would amount to preliminary operation, and where it is to be followed by a total hysterectomy it would certainly add an appreciable risk. In the same length of time the uterus could be removed.

Taking all of these things into consideration I have come to the following conclusions and have made them my basis of practice for some years:

1. In cases favorable for cure from operation it is not always possible to make an exact diagnosis.

2. In our efforts to make our diagnosis exact we are liable to lose the advantage of an early operation by our efforts to secure tissue for examination, in this way disseminating cells and stimulating vicious growth.

3. That a pathological uterus is potentially a malignant one, and that even if cancer is not already present it may develop later.

I therefore believe that the line of safety requires that in those cases occurring in women about the menopause or after, where the symptoms and physical findings would suggest the possibility of malignancy, that our procedure should be a total extirpation of the pelvic organs and the pathological investigation made after the organs have been removed. In 26 such cases cancer was found in 2, or slightly less than 8 per cent.

These conclusions are based on the consideration of malignancy alone, but there are other very excellent reasons for removing such uteri. In the first place they are pathological and have produced enough symptomatology to cause the patient to consult the physician. The pathology has usually existed for a long period of time and the alterations have become so permanent that conservative measures are liable to be disappointing in results.

The organs have fulfilled their usefulness and under normal conditions would be obliterated by nature. We are therefore simply acting in the line of nature when a removal is practised.

Our efforts to conserve often require multiple and time-consuming operations, and the net result of our efforts are to save something that the patient is better off without.

In certain types of bleeding uteri, conservative measures do not relieve. I have had cases of hyperplastic endometritis that have persisted over periods of years, and which have been curetted

repeatedly, with only the most temporary relief, the hyperplasia returning promptly after each curettement. In other cases where the bleeding has been sufficient to keep the hemoglobin under fifty for long periods, examination of the uterus has shown no pathology of the mucous membrane or any tumor formation or any change in the uterus other than slight increase in size and thickening of the wall. I have not found that curettement is of much benefit in relieving the excessive bleeding that so often occurs about the menopause.

When we encounter a pathological uterus at the time of the menopause the first question should be, "Why save the uterus?" The burden of proof is to show why it should be saved. My own opinion is that when such cases present themselves and the symptomatology is completely accounted for by an obvious pathology which can be easily corrected, that this is all that is necessary. On the other hand, when the pathology is gross, particularly when the uterus is enlarged or the cervix indurated or both, and especially when irregular bleeding or debilitating hemorrhages are present, that the most conservative treatment, so far as the present and future welfare of the patient is concerned, is total ablation of the pelvic organs.

In this connection we have to consider two points, mortality and effect of operation on patient. In reference to mortality I have found the radical operation safer than a series of conservative operations. The group of cases considered in this paper is too small to furnish a basis for mortality statistics, but there were no deaths.

As to the after-effects on the patients I have been able to observe no bad results. We have to remember that nature is about to obliterate these organs and their function is over, and in addition they have been the source of impaired health for a more or less prolonged period. My experience has been that the patients improve in health and strength and pass from a state of semi-invalidism, with a tendency to introspection and pessimism, to a cheerful, happy existence in which they are able to take their share in the various activities of life.

In order to secure good results after hysterectomy, however, the technic must be clean and devoid of trauma and the parts left properly supported by attachment of ligaments. While the operation can be quickly done, technic should not be sacrificed to time, and often small details have an immense effect on the future welfare and usefulness of the patient.

I believe that we may fairly conclude the following:

Total abdominal hysterectomy is the operation of election in the pathological uterus at the menopause.

In an appreciable number of such cases cancer will have been found to have already developed.

The adoption of radical methods in dealing with such cases offers the surest protection to women from cancer.

A CONTRIBUTION TO THE NATURE OF THE MONONUCLEAR CELLS SEEN IN THE EXUDATE OF LOBAR PNEUMONIA ACCOMPANYING TYPHOID FEVER.

By Jonathan Forman, M.D.,

and

C. Claron Hugger, M.D.,

columbus, ohio.

(From the Laboratory of Pathology of the Ohio State University.)

In his histological study of typhoid fever Mallory[1] describes the exudation seen in a lung of a case complicated by a typical fibrinous pneumonia of the whole lower lobe in the stage of a gray hepatization. In his specimen a very few pneumococci were present, while a bacillus, morphologically like the typhoid bacillus, occurred more abundantly, and usually within the leukocytes. In the exudate were great numbers of "large phagocytic cells with irregular vesicular nuclei situated peripherally." These cells had ingested both polymorphonuclear leukocytes and red blood corpuscles. Mallory feels that these cells are endothelial leukocytes, for he observed no evidence of migration on the part of these cells. He further observed many mitotic figures in large cells seen in the alveoli. These, of course, might be epithelial as well as endothelial, but Mallory believed after his study of the primary lesions of typhoid fever that it was not unreasonable to assign the same origin to these as that of the other mononuclear phagocytes, *i. e.*, endothelium.

Pratt[2] found that many of the mononuclears in early pneumonia resembled closely the cells seen in the blood and classified as "transitionals." He observed some of these same cells in the blood stream. In spite of the fact that there was not an increase of these cells in the blood stream, he felt that the "transitional" cell did enter into the formation of the exudation of early lobar pneumonia.

Evans[3] approached the problem of the cytology of this exudation in a different manner. He studied, by means of the indophenol blue synthesis, three specimens of lobar pneumonia which came to necropsy on the third, fourth, and fifth days of their disease respectively, together with that found in the early stages of experimental pneumonia in rabbits. Of the mononuclear cells seen in this exudate he described and classified as follows: "(1) A few typical lymphocytes. (2) A few desquamated alveolar wall epithelial cells. (3) Relatively many oxydase-containing, large mononuclears of the blood belonging to the so-called transitional-cell group of Naegeli.

[1] An Histological Study of Typhoid Fever, Jour. Exper. Med., 1898, iii, 632.

[2] Histology of Acute Lobar Pneumonia, Johns Hopkins Hosp. Reports, ix, 265.

[3] Evans, F. A.: The Cytology of the Exudate in the Early Stages of Experimental Pneumonia, Jour. Infect. Dis., 1916, xix, 440. Experimental Study of the Mononuclear Cells of the Blood and Tissues, Arch. Int. Med., 1916, xviii, 692.

(4) Almost as many non-oxydase-containing, large mononuclears of the blood or closely related forms." Further, the injury of the leukopoietic organs by means of benzol resulted in a loss of cells in the exudation when a pneumonia was induced, although the histogenous macrophages had been spared. In the exudation in pneumonia induced in rabbits heavily stained by combined intravenous and intraperitoneal injections of lithium carmine, neither the oxydase nor the non-oxydase mononuclears contained the vital stain.[4]

Winkler, Scultze, Gierke and others have applied the indophenol blue synthesis of Erhlich as a differential test for the recognition of cells of myeloid origin in tissues after formalin fixation. For this purpose the test has become widely recognized. It has been used by Evans upon blood smears (1 and 2) and upon exudates in his studies of the mononuclear leukocytes (3 and 4) and of the reaction of the spleen to acute infections.[5] Forman and Warren[6] have used it in the identification of the cell types in myelomas. For a review of the literature and a description of the technic of the application of this reaction the reader is referred to the papers by Evans. In the light of the observations cited above, a study of the cytology of the exudate in a pneumonia associated with typhoid fever by means of this reaction should prove of interest.

Lobar pneumonia accompanying typhoid infection is not of frequent occurrence, and is usually due to some secondary infection. This is a study of such a pneumonia occurring in a young man, aged twenty years. There was an involvement of the lower lobes of both lungs, which for the most part were in the stage of gray hepatization.

The specimen had been preserved in 10 per cent. formalin for about two years and a half. According to Evans, tissues over a year old have been said to give the indophenol reaction. Graham,[7] with a decidedly modified technic, has been able to demonstrate peroxidase ferments in tissue preserved for six years. It therefore became necessary to investigate further the length of preservation of indolphenol oxydase granules by formalin. The test was applied to sections from specimens of lobar pneumonia in the stage of gray hepatization which had been kept in 10 per cent. formalin several years under the same conditions as the specimens from the typhoid case under consideration. The oldest of these specimens had been preserved for six and a half years. The polymorphonuclear leukocytes in all these specimens contained the characteristic number of indophenol oxydase granules.

[4] Observations on the Origin and Status of the So-called Transitional White Blood Cell, Arch. Int. Med., 1916, xvii, 1. The Practical Significance of the Oxydase Refraction as Applied to Blood Cells, Proc. New York Path. Soc., xv, 144.

[5] Evans, F. A.: Spleen in Acute Infections, Bull. Johns Hopkins Hosp., December, 1916, p. 356.

[6] The Identification of the Cells Seen in Myelomas by Means of the Indophenol Blue Synthesis, Jour. Can. Res., 1917, ii, 79.

[7] The Oxidizing Ferment of the Myelocyte Series of Cells and its Demonstration by Alpha-naphtholpyronin Method, Jour. Med. Research, November, 1916, p. 231.

Unfortunately, cultures were not obtained from the lungs at the time of the autopsy. Microscopically, however, very many bacilli were present in the sections from the pneumonic areas. These resembled closely the typhoid bacillus. Rarely coccoid forms usually arranged in pairs were encountered. While no doubt other organisms were aiding in the production of the pneumonia, the reaction has been definitely influenced by the presence of the typhoid infection in the individual, and, judged by the description and drawings, is quite similar in its cytology with the case described by Mallory.

A few areas of congestion and those containing a typical fibrinous exudation were encountered, but for the most part the alveoli were filled with serum and an abundance of cells. Many of these cells were polymorphonuclear leukocytes, and in some alveoli this type of cell predominated, a few were lymphocytes, and there was an occasional plasma cell. The predominating cells, however, were large mononuclear phagocytes. Relatively a few of these cells were much larger than the others, and frequently contained particles of black and brownish pigment. From their size, morphology, and the fact that no indophenol oxydase granules were observed in them it was assumed that they were epithelial cells. The remainder of the mononuclears resembled each other in size and shape very much. The greater number of these cells contained indophenol oxydase granules. The others, however, did not. The granule-containing cells usually possessed slightly or distinctly indentated and eccentrically placed nuclei. These cells had ingested many red blood corpuscles and to a less extent polymorphonuclear leukocytes. The cells of the other group of mononuclears, which did not give the oxydase reaction, were not so numerous, and apparently they presented more frequently a round or oval nucleus. Cells of this group, however, were observed with irregular nuclei.

That some of these cells may be of lymphoid origin seems probable, and, on the other hand, it does not seem unreasonable to assume, as Mallory did, that some of them are of reticulo-endothelial origin.

In this connection an observation of Graham is of interest. With his alpha-naphthol—hydrogen peroxide—pyronin technic he has noted "that the endothelial cells of the hepatic sinusoids contain larger and smaller bodies that give a typical enzymic reaction." He also observes "that in blood smears occasional cells are found that have all the appearance of the endothelial leukocytes, so-called 'large mononuclear' or 'transitional' cells, but contain a few granules reacting to the alpha-naphthol reagent." Occasionally, in the exudate in our specimen, large mononuclear cells were encountered which tend to confirm Graham's observations. A cell with an oval nucleus has been seen in whose cell body was the nucleus of an ingested polynuclear leukocyte. The cytoplasm of this cell stained a diffuse blue without the presence of definite granules. Again, cells of the same type were encountered in which only a few granules

could be seen. The suggestion of Graham seems probable that such a result is due to phagocytosis, since Winkler has shown that the leukocytic granules resist the action of ptyalin, pepsin, and trypsin even after the remainder of the cell has been broken down.

While such an explanation accounts for a certain number of these mononuclears giving an apparently positive reaction to the indophenol blue synthesis, it does not account for the great number of cells which contain an abundance of oxydase granules. These are of myeloid origin, and, like the cells seen by Pratt and Evans, are best considered as belonging to the so-called transitional-cell group. Another observation which also strengthens this view is that in the lumina of bloodvessels of this lung similar oxydase-containing mononuclears can be found.

We have here a lung in the stage of gray hepatization with an exudation almost identical in its cytology with that seen by Evans. Whether this type of exudation has been continued through the course of the pneumonia due to specific stimulation of the "transitional-cell group" or whether it is due to the stimulation by a superimposed pyogenic infection of injured leukopoietic tissues is not entirely clear. Since, however, the bone marrow in typhoid fever shows definite lesions and the production of granular myelocytes is held in abeyance the last explanation would appear the more probable.

SUMMARY. It would appear that in the exudation in lobar pneumonia accompanying typhoid fever the mononuclear cells predominate. These mononuclear cells may be classified as: (1) lymphoid cells; (2) epithelial cells which have desquamated into the air sac; (3) large mononuclear leukocytes in abundance which contain indophenol oxydase granules; (4) large mononuclear leukocytes which are not so numerous and which do not contain the granules reacting to the indophenol blue synthesis.

UNSUSPECTED SYPHILIS: A STATISTICAL STUDY.

BY JAMES S. MCLESTER, M.D., MAJOR, M. R. C.,

PROFESSOR OF MEDICINE, GRADUATE SCHOOL OF MEDICINE OF THE UNIVERSITY OF ALABAMA, BIRMINGHAM, AND PHYSICIAN-IN-CHIEF TO THE HOSPITAL.

THE object of this paper is to present certain statistical data drawn from the Wassermann reaction as applied to 567 consecutive private patients. Most of these patients were of the well-to-do classes, and all of them were seen in consultation, which fact warrants the assumption that they exhibited, as a whole, the more serious or puzzling diseases of inner medicine. None were supposed to suffer with venereal disease.

The Wassermann tests were done by Miss Blanche Frazier, whose

training has been thorough and long, and every detail which could make for accuracy has been painstakingly studied. The original Wassermann technic, done in half-quantities, was employed, using as antigens alcoholic extracts of both human and beef heart, and an antisheep hemolytic system, adding two full units of complement to all tests together with preliminary ice-box incubation for four hours at 8° C., and final water-bath incubation for one-half hour at 37° C.

Of these 567 consecutive patients, 94, or 16.5 per cent., gave a positive Wassermann reaction; 7, with a negative Wassermann reaction, showed unmistakable clinical evidence of syphilis, thus bringing the known percentage of this disease to 17.8. These figures, then, represent a legitimate estimate of the frequency of syphilis in the better class of patients who suffer with the more obscure or serious medical syndrome.

The anamnesis as regards syphilis is proverbially unreliable. The fact, however, that the patients of whom I write were above the average in intelligence, and in a desire to coöperate, lends additional interest to their histories. Among the 94 individuals whose Wassermann reactions were positive, only 27, or 29 per cent., admitted a venereal ulcer or other evidence of syphilis. It is startling to note that of this number 21 believed themselves cured, most of them basing their belief upon a physician's advice.

Another group of 9, while categorically denying syphilis, gave histories which to the initiated pointed unmistakably to such an infection. Adding these 9 to those who admitted an infection we have 36 patients, or 38 per cent., whose histories pointed with reasonable certainty to syphilis. The remaining 58 (62 per cent. of the entire Wassermann positive group) gave no such history, direct or suggestive.

It is interesting to inquire further into these 58 "Wassermann-positive, history-negative" cases. Six on being confronted with a positive Wassermann reaction then recalled a long-forgotten venereal ulcer. The knowledge gained from a positive Wassermann reaction led always to renewed delving into family and past histories, and in 8 instances syphilis was thus found in husband, wife, or parent. Without the stimulating guidance of a known positive Wassermann reaction this information would have been lost.

There were 10 others of this group who presented clinical evidence which, apart from the serum reaction, would alone point to syphilis. This included 4 instances of aortic aneurysm, 1 of aortitis, 5 of characteristic skin or throat lesions, 1 of a paroxysmal hemoglobinuria, 1 of characteristic neuroretinitis, and 1 of typical cerebrospinal fluid changes.

Turning now to a consideration of the influence of syphilis upon the several internal organs, the heart and the aorta here, as always, are entitled to first place. It is difficult to differentiate invariably between essential myocardial disease, cardiorenal disease, and

simple hypertension. In this series were 30 patients with essential myocardial disease, of whom 14, or 45 per cent., gave a positive Wassermann reaction.

Four of the five patients with aortic aneurysm gave a positive Wassermann reaction.

The arterial hypertension group presents a rather heterogeneous lot, for I have included here those with and without demonstrable arteriosclerosis as well as those with and without obvious kidney disease. There were 65 such patients, and 15, or 23 per cent., gave a positive Wassermann reaction.

There were 26 patients who gave roentgenological and other evidence of ulcer of the stomach or duodenum; 8 gave a positive Wassermann reaction, and 5 of these, under the influence of salvarsan as well as dietetic and other measures, have apparently recovered.

Of 28 patients with pulmonary disease, apparently tubercular, 6 gave a positive Wassermann reaction, and of these 6 only 2 showed tubercle bacilli in their sputum; 5 were given antiluetic treatment, all of whom have experienced satisfactory improvement or cure, but since all had the benefit of the usual hygienic measures, conclusions are difficult. Observation of the roentgenological signs and the clinical course in one of the patients at least, tempts me to state unreservedly that we were dealing with syphilis alone.

The diagnosis of neurasthenia which was given 61 patients needs no defence except the statement that in this group of emotionally unbalanced individuals were placed numerous unfortunates whose disabilities no doubt rested upon the widest variety of unrelated causes. Varicolored perhaps as to morbid processes the group, as a whole, presents a familiar and rather clearly defined clinical entity. Of the 61 neurasthenics 23, or 32 per cent., gave positive Wassermann reactions. In only 1 of these did the spinal fluid suggest organic nervous disease.

While syphilis is known to be an occasional cause of obscure low-grade fever, I have never heard discussed the influence of latent syphilis in causing the continuance of a fever initiated by some other infectious process. There were 2 cases of typhoid fever and 1 of pneumonia, in each of which slight continued elevation of temperature persisted long after the original infection seemed to have subsided. In each of these the Wassermann reaction was positive and the fever promptly disappeared when appropriate treatment was given.

One patient deserves special mention: A physician, whose history was almost identical with that of Fordyce's male nurse, consulted me because of an eruption on his own person which a skin consultant recognized as syphilis. The Wassermann reaction was positive. Eight weeks previously, in giving salvarsan to a patient with florid syphilis, this man had accidentally punctured his own finger and spilled the patient's blood upon his hand which he sought to remove

with a stiff brush. This instance he tells me, and I credit fully his statement, was his only opportunity for acquiring syphilis. No ulcer appeared at the site of the puncture or elsewhere, and a careful but unsuccessful search was made for a scar or discoloration which might give evidence of syphilis otherwise acquired. I am satisfied that his infection occurred as related and without the production of an initial lesion.

The routine use of the Wassermann reaction in private work as well as in the clinic to me has eminently justified itself. It has told of the startling frequency of syphilis in the innocent as well as the guilty, and has clarified many a perplexing clinical problem.

SPIRAL FRACTURES OF THE TIBIA.

By Charles Davison, M.D.,
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Spiral fractures of the tibia are produced by torsion and bending of the leg, and are always accompanied by fractures of the fibula. Spiral fractures are more common in the tibia than in any other bone, constituting fully one-seventh of all fractures of the shaft of the tibia. Adult males are more subject to this injury, probably because of their more hazardous occupations.

The mechanism of these injuries shows that they are the result of indirect violence. A man missteps with one foot or slips on the ice or a banana peel, the other foot remaining fixed in contact with the ground. As his body turns and he struggles to regain his equilibrium, his whole weight is thrown upon one leg. The rotation of the body upon the leg with the foot fixed furnishes a torsion force of the type which produces spiral fractures of the tibia.

In whatever manner the leg may be subjected to a twisting and bending force of sufficient intensity, the tibia, which is the substantial weight-bearing bone of the leg, breaks at the location of least resistance and greatest strain. These fractures uniformly occur at the region of the junction of the middle and lower thirds of the tibia. This is the place of least resistance and greatest torsion strain, because of the size, shape and character of that part of the bone. At this location the bone is smaller and more nearly cylindrical than elsewhere, and the compact bone is extremely dense and inelastic.

The spiral fracture in the tibia is accompanied by a fracture of the fibula, usually impacted in rotation. The fibula is broken in its upper part in the line corresponding to the torsion force. If the direction of the spiral of the fracture in the tibia is followed upward a characteristic injury will be found in the fibula. This injury will be at a very definite location in the fibula, depending upon the angle of the axis of the spiral in the fracture of the tibia to

the shaft of the tibia. The axis of the spiral extended until it reaches the fibula, locates the break in the fibula.

The mechanism of the fracture in the fibula is that of indirect violence. When the tibia breaks the weight of the body and the torsion force are transferred to the fibula, and that bone breaks at a higher level, depending upon the length and direction of the spiral in the tibial fracture. The fragments of the fibula are nearly always impacted. The lower fragment is rotated to correspond to the rotation displacement of the lower fragment of the tibia. This impaction is important, as when it persists it prevents reduction of the fracture in the tibia.

The deformity produced by spiral fracture of the tibia, with impacted fracture of the fibula, as shown by the roentgenogram, is characteristic. The spiral of the fracture in the tibia curves from above downward, forward and outward. The impacted fracture in the fibula is high up, in line with the spiral of the tibial fracture, and the lower fragment is in external rotation. There is 1 cm. to 3 cm. overriding of the tibial fragments, depending upon the amount of impaction of the fibular fragments. The lower fragments of the tibia and fibula retain their normal relationship to each other. The fragments of the tibia have little contact. The amount of separation depends upon the amount of rotation in the impaction of the fragments of the fibula (Fig. 13).

Reduction of spiral fractures of the tibia by external manipulation and extension is not possible while the impaction of the fragments of the fibula remains. Even when the fragments of the fibula are liberated from impaction it is usually impossible to reduce the fracture in the tibia because of the entanglement of the upper end of the lower fragment of the fibula.

Treatment by external manipulation and external immobilization results in good union of the fibula in the impacted position, but in the majority of cases in only partial union, weak union or non-union of the tibia—the strong weight-bearing bone of the leg—in the position of the original deformity. The amount of osseous union often consists in only a slight bony bridge between the displaced fragments. Even a large amount of callus may fail to connect and fix the ends of the fragments (Figs. 1, 2 and 3).

Open operation with surgical fracture of the fibula at the same level as the fracture in the tibia is usually necessary to mobilize the lower fragment of the tibia before reduction can be accomplished. When reduction has been satisfactorily accomplished the fragments of the tibia can rarely be immobilized so that they will remain in position except by the aid of internal fixation, because of the spiral shape of the fractured surfaces.

Internal fixation in these fractures may be best accomplished by the transplantation of bone, by the grafting across the line of fracture, in the medullary canal, of a splint of fresh live bone from

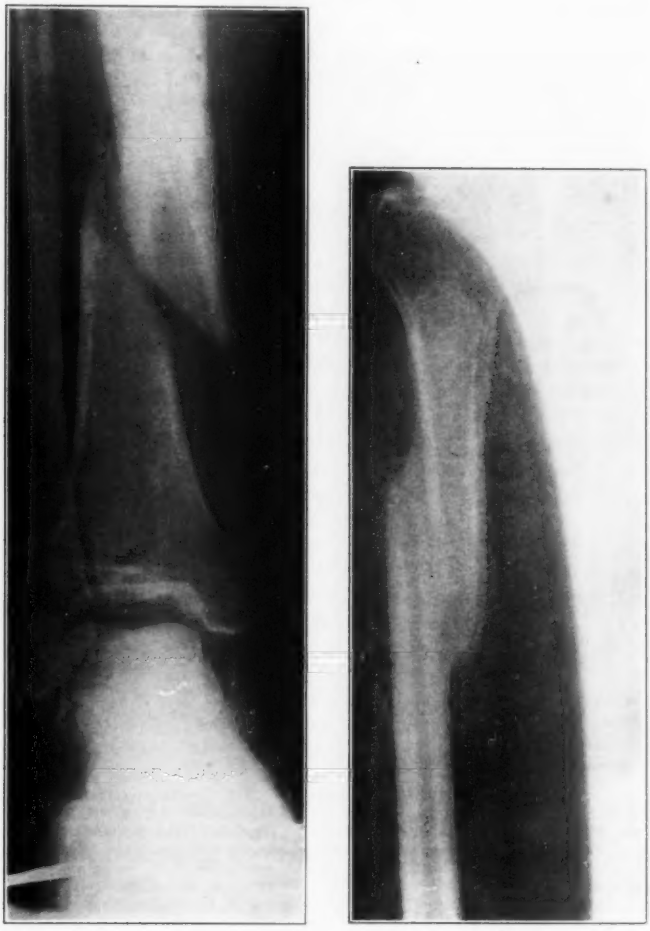
the same individual. This furnishes a method of alignment and fixation by a living, germ-resisting, osteogenic structure, which is treated kindly by the tissues and which heals in as an integral part of the body.

FIG. 1.—Roentgenogram of a spiral fracture of the tibia, with an impacted fracture of the fibula, treated by external manipulation and external immobilization, showing non-union of the fracture in the tibia one year after injury.

FIG. 2.—Roentgenogram of a spiral fracture of the tibia, with an impacted fracture of the fibula, treated by external manipulation and external immobilization, showing a large amount of callus, but failure of weight-bearing union.

The transplant aligns the fragments, stimulates osteogenesis at the injury, lives and grafts to the compact bone of each fragment, when actual contact has occurred between the transplant, from which the periosteum has been removed, and the compact bone of each fragment and when the limb has been properly immobilized by external means, so that there can be no movement between the transplant and its host.

Under these favorable conditions the transplant becomes a living integral portion of the repaired bone, taking its part in the functional



a *b*

FIG. 3.—*a*, roentgenogram of spiral fracture of the tibia treated by external manipulation, followed by nail-extension with twenty pounds of weight for three weeks, without change of position of the fragments; *b*, roentgenogram of impacted, rotated fracture of the fibula which prevented reduction.

support of the extremity and maintaining for the time its shape and size, later to be modified, like any other part of the skeleton, by the conditions and functional demands put upon it. It remains as long

as its support is required, and then the superfluous part is gradually absorbed as the repaired bone resumes its function. The medullary canal is reëstablished as absorption of the transplant progresses. The primary function of the transplant is the alignment of the fragments. Grafting of the transplant to the fragments is secondary, but very desirable.

The operative technic demands the rigorous application of the rules of asepsis as distinguished from antisepsis. Iodin preparation is prohibited. Antiseptics destroy the living bone cell of the transplant as quickly and surely as they destroy the pyogenic germ.

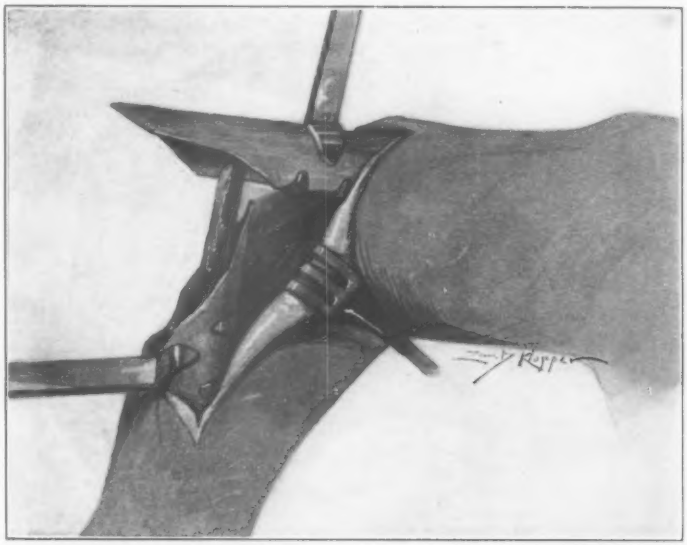


FIG. 4.—Introduction of the transplant in autoplastic repair of spiral fracture of the tibia.

The fracture in the tibia is exposed by a flap incision, so that the repaired fracture will not be directly exposed to the danger of a skin wound. The fibula is fractured with a chisel at about the same level. The fragments of the tibia are secured by small Lowman clamps for manipulation, and are elevated. The detritus produced by the injury is cleared from the wound and the fragments are prepared for the transplant. The medullary canal of each fragment is cleared, with a bone curette, of that part of the marrow which has been disturbed by the traumatism, hemorrhage or inflammation, and then examined and measured with calipers to determine the shape and size of the transplant needed to mortise the fragments together.

A transplant is usually secured from the upper part of the crest of the same tibia. In length the transplant should be sufficient to extend into each fragment at least 2.5 cm. It is fitted to the irregularities of the upper fragment so that it will slip in and out. The other end of the transplant is fitted and driven into the lower fragment. If the transplant is too large it will split the fragment and the fixation will be destroyed. Care is exercised to make the irregular fitting between the transplant and each fragment correspond, so that when the transplant is in final position the fragments will be locked by it in correct rotation. If it is doweled or the medullary canal is reamed until it is circular the spiral fragments of the tibia will rotate and the accuracy of the reduction will be lost. The end of the transplant projecting from the lower fragment is manipulated

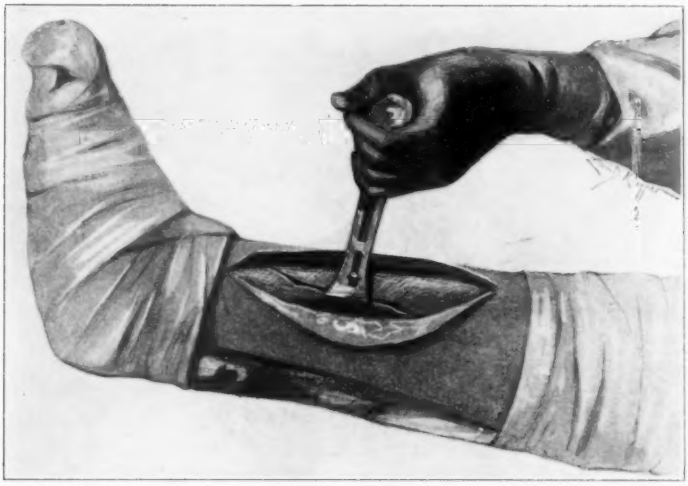


FIG. 5.—Immobilization of the fragments over the transplant, before closure of the wound and application of the cast, in spiral fracture of the tibia.

into the prepared upper fragment and the leg is straightened (Fig. 4). The muscles of the leg immediately contract and bring the fragments firmly together in alignment over the transplant. One Lowman clamp is now removed and the other is slipped over the repair so as to grasp the ends of both fragments (Fig. 5). The leg is elevated by means of the clamp and a narrow, sterile, moulded plaster splint, previously prepared and dried, is applied to the posterior part of the leg with sterile bandages above and below the wound. The clamp is removed. The wound is closed in layers by catgut sutures and dressed. A circular plaster-of-Paris cast is applied over all. The immobilization is not disturbed during the convalescence.

CASE I.—*Spiral fracture of the tibia and impacted fracture of the fibula.*

M. W., aged forty-four years, Swedish, teamster, was admitted to Cook County Hospital March 13, 1916, suffering with a broken left leg, produced by slipping and falling on the sidewalk the previous day.

FIG. 6.—Case I. Roentgenogram of spiral fracture of the tibia.

FIG. 7.—Case I. Roentgenogram of impacted, rotated fracture of the fibula, preventing reduction of the fracture in the tibia.

Roentgenograms revealed a spiral fracture of the tibia, with displacement and overriding of 2.5 cm. (Fig. 6) and an impacted, rotated fracture of the upper end of the fibula (Fig. 7).

Failing to effect reduction by external manipulation, open operation for autoplastic repair was performed March 20, 1916. The fracture was exposed by a flap incision. It was impossible to replace the lower fragment of the tibia because of the position of the impaction of the fragments of the fibula. To facilitate reduction of the fragments of the tibia the fibula was broken at the same level.

A transplant 15 cm. in length was obtained from the crest of the same tibia well above the fracture. The thickness of the transplant was determined by caliper measurements of the medullary canal of the fragments and the defect between them. After careful fitting the transplant was driven into the medullary canal of the lower

FIG. 8. — Case I. Roentgenogram of autoplastic repair of spiral fracture of the tibia, immediately after operation, showing the transplant across the line of fracture, securing the fragments in reduction.

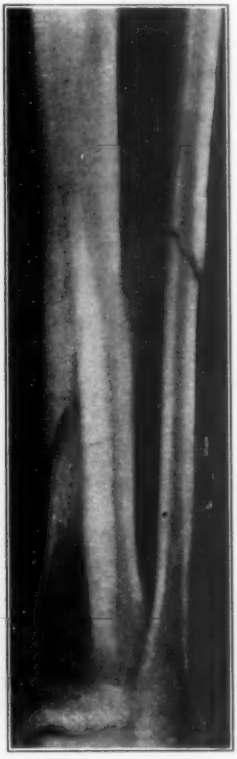


FIG. 9.—Case I. Roentgenogram of autoplastic repair of spiral fracture of the tibia, eight weeks after operation, showing the transplant grafted into the medullary canal and bony union of the fracture.

fragment. The free end of the transplant was then manipulated into the medullary canal of the upper fragment. The fragments were placed in accurate reduction, with a clamp holding them in position during subsequent manipulations. A sterile, posterior, moulded splint was bandaged to the leg above and below the wound for

temporary support. The clamp was removed, the wound closed, dressed with gauze and a circular cast applied over all.

A roentgenogram taken after the operation revealed the transplant in the medullary canal across the line of fracture of the tibia, supporting the fragments in anatomical reduction (Fig. 8).

The immobilization was not disturbed for four weeks, when healing appeared to be complete and union of the fracture was firm. A roentgenogram taken eight weeks after operation revealed good union of both bones (Fig. 9). Functional recovery was apparently complete.

FIG. 10.—Case II. Roentgenogram of compound spiral fracture of the tibia.

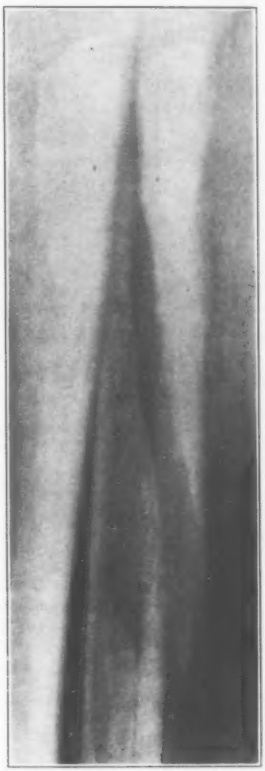


FIG. 11.—Case II. Roentgenogram of rotated spiral fracture of the fibula.

CASE II.—*Compound spiral fracture of the tibia and impacted fracture of the fibula.*

J. W., aged forty years, American, bench worker, was admitted to Cook County Hospital on May 11, 1916, with a compound

fracture of the right leg. He gave a history of having been thrown while scuffling. His toe was caught under the edge of a carpet and his leg twisted as he fell.

FIG. 12.—Case II. Roentgenogram of autoplastic repair of spiral fracture of the tibia, five weeks after operation, showing the transplant grafted into the medullary canal across the line of fracture and bony union of the fracture.

FIG. 13.—Case III. Roentgenogram of a spiral fracture of the tibia and an impacted fracture of the fibula.

Examination showed a fracture of the tibia, with an external wound communicating with the fracture. Roentgenograms revealed a long spiral fracture of the lower third of the tibia (Fig. 10), accompanied by a rotated, impacted fracture of the fibula immediately below its head (Fig. 11). The lower fragment of the tibia was rotated and displaced outward. There were 2.5 cm. overriding of the fragments.

The wound was cleansed and dressed and the extremity was immobilized in a fracture-box. Sterile healing of the wound of the soft parts was complete in three weeks.

The position of the fragments not having been changed by treatment, open operation for reduction and fixation of the fracture by the same technic as in Case I was performed May 31, 1916.

When the cast was removed at the end of five weeks, good union of the fracture was present (Fig. 12).

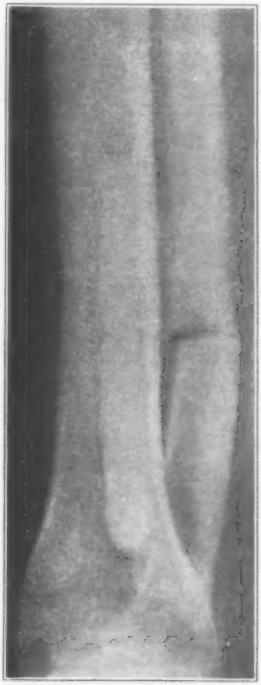


FIG. 14.—Case III. Roentgenogram of autoplastic repair of spiral fracture of the tibia, two months after operation, showing the transplant grafted across the line of fracture and bony union of the fracture.

FIG. 15.—Case III. Roentgenogram of autoplastic repair of spiral fracture of the tibia, eighteen months after operation.

CASE III.—*Spiral fracture of the tibia and impacted fracture of the fibula.*

L. K., aged thirty-three years, American, laborer, was admitted to Cook County Hospital January 10, 1914, with a fracture of the left leg. A roentgenogram showed a spiral fracture of the tibia and an impacted fracture of the fibula. There was overriding and complete displacement of the fragments of the tibia (Fig. 13).

After repeated failures of reduction by external manipulation

and traction, open operation for autoplastic repair was performed two weeks after injury. The technic of the operation was similar to that used in Case I.

FIG. 16.—Case III. Roentgenogram of autoplastic repair of spiral fracture of the tibia, eighteen months after operation, showing absorption of the greater part of the transplant and reëstablishment of the medullary canal.

FIG. 17.—Case III. Roentgenogram of the same area shown in Fig. 16, thirty months after operation, showing practically no further absorption of the transplant.

Firm union appeared to be present when the cast was removed four weeks after operation. A roentgenogram taken eight weeks after operation shows anatomical reduction of the fragments of the tibia and bony union of the fracture (Fig. 14). A roentgenogram taken eighteen months after operation shows complete bony repair of all fractures, but with much less callus surrounding the fractures of the tibia than those of the fibula (Fig. 15). It also shows partial

absorption of the transplant. The medullary canal has been reëstablished, and apparently only that part of the transplant remains which is needed for the functional support of the tibia (Fig. 16).

A roentgenogram of the tibia taken thirty months after operation shows the condition of the transplant to be almost identical with the examination of the previous year. The absorption of the transplant has apparently ceased. What remains seems to have become a permanent support to the tibia at the point of the healed fracture, correlating the strength of the bone with its functional necessities (Fig. 17).

Conclusions. 1. Treatment of spiral fractures of the tibia by external reduction and external immobilization usually results in imperfect union of the fragments with defective function of the leg.

2. Treatment by open operation and autoplastic repair usually results in early good anatomical union of the fragments with restoration of the strength and function of the leg.

3. The autoplastic transplantation of bone in the repair of a recent spiral fracture of the tibia is a capital operation, which requires careful technic, capable assistants and aseptic surroundings.

ACHYLIA GASTRICA AND CHRONIC CONNECTIVE-TISSUE LIENTERY: A CLINICAL STUDY OF 322 CASES.

By Noble Wiley Jones, M.D.,
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For a number of years past, especially since Adolf Schmidt devised his intestinal test diet and recognized by it certain gastrogenic intestinal affections, several disturbed phenomena of digestion have been assumed to take place in chronic achylia gastrica. First, the digestion of connective tissue has been held dependent upon its contact with free hydrochloric acid in the stomach for a sufficient length of time; second, the emptying time of the stomach has been thought to be much shortened; third, the power of the stomach to disintegrate food and destroy bacteria has been considered much decreased. Reasoning *a priori* gastrogenic intestinal catarrh and dysentery have been looked for as an accompaniment of achylia gastrica due to undigested connective tissue and nondisintegrated foods in general, and when such catarrh or dysentery was found in the presence of normal stomach chemistry it was assumed that for some reason an abnormal pyloric insufficiency existed. The frequent finding of irregularities in the sequence of these factors leads one to wonder what other factors enter into the cause of the associated symptoms of constipation or dysentery, of

connective tissue or mucus in the stools, or, on the other hand, why an entire absence of all subjective symptoms may exist in individuals in whom achylia gastrica is found accidentally during a routine examination. Many of our patients have been reëxamined after a period of years when they considered themselves perfectly well and had returned to meat-eating, and still the anacidity has been found to be present. What has determined the presence of health and strength in the one case, and oftentimes a semi-invalidism in the other?

Achylia Gastrica. These observations are based upon the clinical study of 245 cases of achylia gastrica observed in private practice between the years 1906 and April, 1916. Into this group of cases has been placed only those to which Einhorn originally gave the name, *i. e.*, those in which there is an absence of hydrochloric acid and ferments in the gastric secretion. Therefore, all instances of anacidity associated with pernicious or other grave anemias, stomach cancer, and wasting diseases, as advanced tuberculosis or nephritis, have not been considered. The group, however, contains all cases of chronic anacidity, both true and spurious achylias. No attempt has been made to differentiate between the psychical and chemical types of achylia of Pawlaw by means of fractional methods of studying the entire period of gastric digestion. These patients have come to us, for the most part, because of gastro-intestinal symptoms, and our present conclusions in regard to prognosis and therapy have been influenced much by our studies of the medical aspects of abdominal ptosis and its related phenomena.

The incidence of achylia gastrica in gastro-intestinal diseases is so great that it necessitates one bearing it always in mind in general diagnosis. Many times it is diagnosed cancer of the stomach, amebic dysentery, nervous diarrhea, or a neurasthenia. Stockton found, in 1909, that his 132 cases bore a ratio to other stomach diseases examined as 1 is to 20. In 1911 a review of 600 cases of mine with abdominal symptoms afforded 47 cases of achylia, or an incidence of 1 to 12.7. It is my impression that this ratio holds approximately with the larger number of cases reviewed here. Such a frequency demands a more consistent study of the condition than has thus far been accorded it.

In reviewing my series of cases I wish to present merely some clinical features which I believe to be of importance. Especially is this so in relation to the prognostic and therapeutic aspects. Table I is a *résumé* of the salient features of the 245 cases. There are 96 males and 149 females. In both groups the largest number of cases appear during those years when there is the greatest strain put upon the mind and body of the individual, *i. e.*, between the years of forty and sixty in man, when he is bearing his greatest responsibilities, and during the active child-bearing and menopause periods in women. Viewed from a stand-point of

the body build, 132 have an asthenic type of structure and 113 possess broad frames. But as the general asthenic state is not confined to individuals of asthenic type of build, the presence of general asthenia in 182 cases is of more significance. Many times the patient dates the beginning of his symptoms to some definite exciting cause; a pregnancy, an infectious fever, an operation, or a period of some emotional stress. More and more, as the earlier cases were observed through the succeeding years and relapses studied, did this factor of an exciting cause leading to a general asthenia become apparent. Ten patients of the series stated that the beginning of their ill health dated back to definite periods of excessive worry. In the severe general asthenics many had a history of chronic gastro-intestinal symptoms from childhood on. Thus the parallelism between the onset and course of the symptoms in the majority of these patients and in a corresponding series of general asthenics with normal stomach chemistry is most striking. The presence of the general asthenic state is the one factor which stands out in bold relief from among all others.

TABLE I.—NUMBER OF CASES, 245.

		Age				
		Under 15.	15 to 25.	25 to 40.	40 to 60.	Over 60.
Sex	Male, 96	1 to 8 years	7	13	59	16
	Female, 149	0	9	57	75	15

		Connective tissue in stools
Exciting causes	Leading to general asthenia	143
	Absent or unrecorded	98
Symptoms	Gastro-intestinal	239
	Wholly referred	43
Build	Asthenic type	132
	Broad	113
Associated diseases		81
General asthenia	Present	182
	Absent	62
	Unrecorded	1
Dysentery		90
Constipation		157
Mucous colitis		35
Connective tissue in stool	Present	130
	Absent	66
	Unrecorded	46
End-result	Good	141
	Fair or poor	55
	Unrecorded	49

Sixty-two patients of the series gave no evidence of a general body weakness. The symptoms of this group are noticeably different from those of the asthenic group. Headaches, muscular and joint pains (so-called toxic symptoms), in addition to the gastro-intestinal distresses, usually present, were most manifest. The majority of these patients were broadly built, and there was present a gastrogenic dysentery far more frequently than in the

TABLE II

Name.	Sex.		Age.	Build.		Stomach.		Ileum.		Cecum.		Colon.		Constipation.	Dysentery.	Mucous colitis.	Stool.		Local infections.	End-result.	No. of cases.
	Male.	Female.		Broad.	Asthenic.	Position.	Emptying time, hours.	Stasis.	Regurgitation.	Mobility.	Stasis.	Ptosis.	Stasis.				Connective tissue.	Mucus.			
W. W. B.	–	..	61	–	..	O. K.	2½	Trace	+++	0	0	0	0	Trace	+	..	++	0	+	Fair	1
E. E.	–	..	60	–	..	O. K.	3½	0	..	0	0	0	0	+	0	..	+	+	+	Good	2
J. A. R.	..	–	39	..	–	Low	5 to 6	0	..	+	0	+	0	+	0	..	0	0	0	Questionable	3
Sam.	..	–	70	..	–	Low	7	0	..	+	0	+	0	+	0	..	++	+	0	Poor; chronic gall-bladder	4
C. W.	–	..	46	–	..	O. K.	4½	+	..	0	0	..	+	+	0	..	0	++	0	Good	5
A. M. T.	..	–	47	..	–	Low	6 –	0	..	+	72 hr.	+	+	+	0	..	++	++	0	Fair; psychasthenic	6
G. T.	..	–	32	–	..	O. K.	2½	0	..	0	0	+	+	0	+	..	0	++	0	Good	7
C. S.	..	–	26	..	–	Low	5	+	+	+	0	+	0	0	0	..	+++	+	0	Poor; not controlled	8
C. M. H.	..	–	56	–	..	O. K.	5½	0	+	+	0	0	+	+	0	..	+++	0	+ trace	Good	9
D. G.	..	–	50	..	–	O. K.	6	+	..	0	+	+	+	+	0	..	0	+	+ formerly	Good	10
R. G. H.	–	..	49	–	..	O. K.	3½	0	..	0	0	0	0	0	0	..	0	+++	0	Good	11
I. C. B.	..	–	32	..	–	Low	3	0	..	+	0	+	0	0	+	..	0	+	..	Good	12
Ia.	..	–	50	..	–	Low	6+	+	..	0	0	+	+	+	0	+	+	++	0	Good	13
E. H.	..	–	58	..	–	Low	5½	+	..	+	0	+	+	+	0	..	++	+	+	Fair; gall-bladder (postop.)	14
C. W. H.	..	–	48	..	–	Low	6	0	..	+	+	+	+	+	0	..	+	++	0	Good	15
G. L.	..	–	82	..	–	Low	6	0	..	0	+	+	+	+	0	+	0	+++	+	Good	16
T. R.	..	–	66	..	–	Low	6	0	..	+	0	+	+	+	0	..	++	0	+	Good	17
A. E. W. P.	–	..	56	–	..	O. K.	4½	0	..	0	0	0	+	+	0	..	+	0	..	Fair; business worry	18
G. E. M.	..	–	38	..	–	O. K.	6	0	..	0	+	0	+	+	0	..	Trace	++	..	Good	19
L. V. W.	..	–	30	..	–	Low	4	+	..	+	0	+	+	+	0	..	+++	+	..	Good	20
C. W.	..	–	35	..	–	Low	6	0	..	+	0	+	+	+	0	..	++	+	+	Fair; organic heart disease; died later	21
W. E. W.	..	–	36	..	–	Low	6	0	..	0	0	+	+	0	+	..	0	0	+	Poor; chronic gall-bladder; died from operation	22
E. P. T.	..	–	53	–	..	Low	5	+	..	0	+	+	+	+	0	..	0	+	+	Good; chronic arthritis	23
I. S.	–	..	63	..	–	O. K.	5	0	..	0	0	0	+	+	0	..	0	0	0	Fair; cardiovascular	24
Las.	..	–	57	..	–	Low	6	0	..	0	+	+	+	+	0	..	++	0	0	Good	25
R. L. M.	..	–	47	..	–	Low	5½	0	..	0	0	+	0	0	0	..	0	0	..	Questionable	26
L. B. N.	..	–	26	..	–	Low	3½	0	..	+	0	+	0	0	0	..	+++	+	..	Poor; psychoneurosis	27
G. S.	–	..	58	–	..	O. K.	3½	0	..	0	0	0	0	0	+	..	+++	0	+ formerly	Good; arrested tuberculosis	28
Totals	7	21		9	19	O.K. 11 Low 17		9	3	11	7	17	18	20	5	2	14	17	10		

asthenic group. These patients also did not lose weight or strength; and, what is of great significance, they received, for the most part, quick relief from their symptoms as soon as the bowel condition was corrected. This was in sharp contradistinction to the asthenic type.

An attempt was made in the study of 28 cases of achylia to harmonize, if possible, the occurrence of connective tissue in the stool and the presence of dysentery or constipation with an early emptying time of the stomach, and with the presence of abdominal ptoses and local stases. The details of this study are to be found in Table II and a *résumé* of the data in Table III. Certain deductions may be made even from this limited number of observations.

TABLE III.—ACHYLIA GASTRICA. RÉSUMÉ OF 28 CASES.

Build	Asthenic type		19
	Broad type		9
Position of stomach	Low		17
	Normal		11
			Connective tissue in stools.
Less than 4 hours, 2	Constipation	0	—
	Normal	1	0
	Dysentery	1	1
Four hours or over, 15	Constipation	13	9
	Normal	1	1
	Dysentery	1	0
Less than 4 hours, 5	Constipation	1	1
	Normal	1	1
	Dysentery	3	3
Four hours or over, 6	Constipation	6	3
	Normal	0	—
	Dysentery	0	—

The majority of instances of constipation were associated with an emptying time on the part of the stomach of four or more hours, and the majority of them are found also in ptotic individuals in whom the mechanical factors of constipation, as regards position, play a part. Of the 5 cases of chronic dysentery, 4 of them were associated with a too rapid emptying of the stomach, and 3 of these were found in broadly built individuals in whom the stomach occupied a relatively high position in the abdomen. There was found no guiding relationship between ileum stasis, cecum mobile, or cecum stasis, general colon stasis and ptosis, and the presence of connective tissue, or the quantity of mucus in the stool, or with the occurrence of constipation or dysentery, or, again, with the emptying time of the stomach. The size, position, and activity of the stomach showed no distinguishing features in the achylia cases from other individuals. In the majority of the asthenically built patients the stomach was low, atonic, and the peristaltic waves feeble. The organ also did not empty itself of the greater part of

the meal rapidly and then lie dormant with a moderate rest for a longer time, as one might assume. The stomach picture under the screen appeared tonic or atonic, depending upon the degree of general asthenia, absent or present, in the individual. It was wholly impossible to distinguish the atonic stomach of an asthenic achylic patient from that of the ordinary asthenic patient with normal stomach chemistry. Focal infections involving mostly the teeth and the tonsils were met with in variable degree ten times. No causative relationship could be ascribed to them.

Chronic Connective-tissue Lientery.[1] The failure on the part of the stomach in the presence of normal chemistry to digest connective tissue, and the latter's appearance in abnormal quantities in the stool, frequently gives rise to much the same series of gastro-intestinal disturbances that are seen in chronic achylia. The symptoms seem also to bear the same relation to the exciting causes of general asthenia. The type of build of the patient in whom the condition is met likewise influences the response to treatment in the same way, for in the ptotic type of individual the added factor of general asthenia is usually encountered, and this must be overcome before the patient becomes symptom-free.

It has been assumed, as stated above, that the emptying time of the stomach determined the presence or absence of undigested connective tissue in the stool. So far as I know no accurate observations have ever been made to determine this point. There are met in routine röntgenological examinations of gastro-intestinal cases many instances of gastric hypermotility due, for instance, to duodenal ulcer or periduodenal lesions, but I have been often impressed with the fact that these patients do not frequently have connective tissue in their stools from intestinal test diets. In the hopes of obtaining some guiding data in this group of cases I have reviewed 77 cases observed from 1906 to April, 1916. The resulting general data is set forth in Table IV, and 10 of these cases have been studied more in detail, as itemized in Table V. In the latter table the stomach's emptying time of Cases No. 1 and No. 3 cannot be considered, as the time was not accurately observed; but in the remaining 8 cases 6 were of a broad non-ptotic type of build, and it is to be noted that in 5 of these 6 cases the stomachs were emptied in two and one-half, two and one-half, three, two, and two and one-half hours respectively. Again, the remaining 2 patients (No. 4 and No. 10) were of the asthenic type of build with prolapsed stomachs, and the emptying time was six hours and seven plus hours respectively. In other words, the mechanical influence of position, coupled with a lack of muscular tone, brought about this difference in motility, although each patient possessed three plus connective tissue in his stools. Chronic dysentery is more

[1] Chronic connective-tissue lientery is here arbitrarily defined as the presence of abnormal quantities of undigested connective tissue in the stool without regard to the derivation of the word lientery.

frequent in patients of a broad type of build, and obstinate constipation is much more frequent in those with abdominal ptosis. The reasons why a hypermotility of the stomach existed in many cases, why connective tissue was found in the stools of constipated patients possessing either a hypermotility or a delayed motility, or why chronic dysentery is associated in one case with a hypermotility of the stomach and in a second case with a delayed motility are not known. They concern the physiological factors of gastric and colon motility, which are as yet not understood.

TABLE IV.—CHRONIC CONNECTIVE-TISSUE LIENTERY. 77 CASES.

		Age					
		Under 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	Over 60.
Sex	Male, 34	1	5	11	11	4	2
	Female, 43	1	10	18	5	4	5

Type of build	Broad, 42	Regular	10
		Constipation	16
		Dysentery	10
		Alternating	6
	Asthenic, 35	Regular	3
		Constipation	20
		Dysentery	3
		Alternating	9

Mucous colitis	13
Focal infections	15

	Good.	Fair.	Poor.	Unknown.	Died.
End-results	47	7	5	17	1

PROGNOSIS. It has seemed to me that theoretically all cases of uncomplicated chronic achylia gastrica and chronic connective-tissue lientery were amenable to treatment. Practically this end is not always attainable, (1) because of lack of sufficient control over the individual, and (2) because of one's inability to always remove the exciting cause of an accompanying general asthenia. Especially is this true when an emotional stress, as worry, cannot be overcome.

The prognosis of either condition in a physically strong individual is always good. The so-called toxic symptoms and the gastro-intestinal distresses disappear, as a rule, quickly as soon as the diet is corrected and the frequently accompanying colitis is allayed. In the asthenic type of patient, however, the problem is different. The added factor of general asthenia demands oftentimes the long detailed course of body rebuilding which is necessary to successfully treat the general asthenic patient that possesses a normal stomach chemistry. The asthenic achylic patient is oftentimes a difficult patient to handle. A large percentage of them must be treated in hospital under control if a satisfactory end-result is to be obtained. In place of viewing the achylic patient in a semihopeless manner, as is still customary, we have learned to expect good results when the

TABLE V

Name.	Sex.		Age.	Build.		Stomach.		Ileum.		Cecum.		Colon.		Constipation.	Dysentery.	Mucous colitis.	Stool.		Local infections.	End-result.	No. of cases.
	Male.	Female.		Broad.	Asthenic.	Position.	Emptying time, hours.	Stasis.	Regurgitation.	Mobility.	Stasis.	Ptosis.	Stasis.				Connective tissue.	Mucus.			
E. M. O'B.	–	..	42	+	..	O. K.	6	0	0	0	0	0	0	0	0	0	+++	++	+	Cardiorenal impairment	1
E. B. L.	–	..	43	+	..	O. K.	2½	+	0	0	0	0	0	0	+	0	+++	+	0	Good	2
H. A. Mc.	–	..	32	+	..	O. K.	6	0	0	0	0	0	+	+	+	0	+	0	0	Good	3
H. R. S.	..	–	28	..	+	O. K.	6	0	0	0	0	+	+	+	0	0	+++	+	+	Good	4
J. R.	–	..	49	+	..	O. K.	2½	0	0	0	0	0	0	+	0	0	++	0	0	Good	5
K. L.	–	..	31	+	..	O. K.	3	0	++	0	0	0	0	0	+	0	++++	0	0	Fair	6
C. M. R.	..	–	45	+	..	O. K.	6	0	0	0	0	0	0	0	+	0	+++	+	+	Poor; goitre; O. H. D.; chronic arthritis	7
H. W. C.	..	–	67	+	..	O. K.	2	0	0	0	0	0	0	0	+	0	+++	+	0	Good	8
H. H.	..	–	35	+	..	O. K.	2½	+	..	0	0	0	0	+	+	0	++++	+	0	Good; psycho-neurosis	9
L. B. D.	..	–	29	..	+	Low	7+	0	0	+	0	+	0	0	+	0	+++	+	0	Good	10
Totals	5	5		8	2	O. K. 9 Low 1		2	1	1		2	2	4	7		10	7	3		

patient's adherence to these principles can be maintained over a sufficient length of time.

TREATMENT. The principles of treating achylia gastrica and connective-tissue lientery embrace in all cases two factors: (1) the avoidance of connective tissue during at least the symptom-bearing period, and (2) the mechanical preparation of all food for entrance to the small intestine. Sufficient chymification of food rarely takes place in the anacid stomach whether it remains a short or a long period of time. The thorough preliminary cooking of vegetables is necessary in order to separate masses of vegetable cells. The more thorough the mechanical division of the food is carried out by cooking, sieving and chewing it, the quicker is the secondary bowel disturbance relieved. With the general asthenic type of patient the accompanying general asthenia must be definitely overcome before relief can be expected. The fundamental principles of overcoming the general asthenic state apply here as elsewhere. The use of hydrochloric acid theoretically to replace the acid reflex of Pawlaw is, from a practical stand-point, an individual matter. Many patients are symptomatically relieved by its use while others experience increased sourness and stomach irritation. Its use must be governed accordingly.

After the patient has regained his normal health he may, as a rule, return to meat-eating with impunity; at least, many do and apparently without harm. Why this is so it is impossible to say. Schutz and others have thought best to explain the production of the resulting gastrogenic intestinal state by reason of the long-continued failure of the acid reflex bringing about eventually an insufficiency of intestinal digestion, more especially that of the pancreas. Changes in the flora and the biochemistry of the bowel result. Against this view, it seems to me, would be the fact that insufficient starch and nuclein digestion rarely is found in the stools of chronic achylics. The question of restoring a normal fund of general body tone has seemed to me to be the deciding factor in many of these cases. The bowel then simply is capable of throwing off irritating foods without receiving harm from them. As soon as the general body strength is lowered the power of the bowel to do this is reduced and symptoms appear. This explanation does not seem to hold true in some of the broadly built patients who suffer symptoms without loss of body strength. Some patients of this type are never able to return to meat-eating without ill effects.

CONCLUSIONS. 1. Achylia gastrica is usually associated with a too rapidly emptying stomach in the broadly built, non-ptotic person. In the ptotic individual the factors of position and atonia seemingly tend to overbalance this tendency, and the emptying time of the stomach may be as long as seven hours or longer.

2. Both of the above conclusions seemingly hold true in the case of chronic connective-tissue lientery.

3. In both groups of cases dysentery is prone to occur in the non-ptotic type of person in whom a hypermotility of the stomach is present. Contrariwise, constipation is apt to be found in the ptotic individual in whom the mechanical factors leading to constipation exist.

4. The symptoms and response to treatment in both groups of cases differ noticeably according to the presence or absence of the general asthenic state.

5. Both groups of cases are distinctly amenable to treatment, and good end-results can be obtained under suitable conditions.

DIGITALIS AND THE CONTROL OF AURICULAR FIBRILLATION AND AURICULAR FLUTTER, WITH ELECTROCARDIOGRAMS ILLUSTRATING THE EFFECT.

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The intention of these remarks is to offer for discussion and in that way emphasize a method of using digitalis in some forms of cardiac decompensation and arrhythmia.

No review of the physiological action and preparations of digitalis will be attempted, but it is necessary to state the preparation, the size of the doses, and the method of administration that the indications which guided in their use may be understood. To illustrate the type of case and the desirable and expected action of digitalis, 4 cases will be briefly related and the electrocardiograms showing various effects exhibited.

In the choice of preparations, preference has been given in the order related to the tincture, the infusion, digipuratum, and, for emergencies, crystalline strophanthin (Thoms), or methyl-g-ouabain, which Hatcher believes to have the same action. The tincture was given in 15 to 30 minims, not drop doses, every four hours, as a maximum dose. The infusion in ½-ounce doses was used when edema was extreme. If objection was made by the patient to the fluid preparations, digipuratum was given in minimum doses of four tablets in the twenty-four hours. If none of these preparations could be used, or immediate action was desired, crystalline strophanthin (Thoms), 0.0005 gram, diluted in 2 to 4 c.c. of freshly distilled water, or salt solution (this is the equivalent of 1 to 4000 to 1 to 8000), and injected slowly into a vein, or half this dose may be given twice a day. Strophanthin in such a dose

should not be given if the patient has had any of the digitalis bodies during the previous week, nor should it be repeated within twenty-four hours. These precautions must be observed, since digitalis and strophanthin are synergists, and in the circumstances stated the total effect of absorbed digitalis and of the rapidly absorbed strophanthin might very well be quickly and fatally toxic. The amorphous preparations of strophanthin are only about half the strength of the crystalline, and unreliable.

Nausea and vomiting may be produced by digitalis, and they are also distressing complications of heart failure. If these symptoms have resulted from the digitalis, it has required three or four days of dosage with the drug; but if they belong to the heart failure, it follows immediately from any distasteful potion. The element of time of onset of the nausea and vomiting is important in the differential. When nausea or vomiting is present, precluding the use of the drug by mouth, and the digitalis effect is desired, strophanthin may be used intravenously, or an enema may be given, consisting of 120 c.c. of milk containing either 2 c.c. of the tincture or 30 c.c. of the infusion of digitalis. If the digitalis produces nausea before it slows the heart it will avail nothing to change the preparation, in the belief that by so doing the nausea will cease, for the nausea is the result of the digitalis acting on the vomiting center in the medulla. Eggleston and Hatcher[1] believe they have shown conclusively by animal experiment that both vomiting and diarrhea are of central origin. Nausea occurs most frequently before slowing of the heart in patients with marked arteriosclerosis.

In arteriosclerotics with fibrillation of the auricle and Cheyne-Stokes type of periodic breathing, digitalis may prolong the period of apnea and exaggerate the dyspnea portion of the cycle. Small doses, 5 minims of the tincture of belladonna, may give prompt relief and should be continued until digitalis effect is relieved.

Working with isolated coronary arteries, C. Voegtlin and D. I. Macht[2] believe they have shown that digitonin causes a relaxation of the arterial wall, while digitoxin and digitalin cause constriction. The great efficacy of the infusion is due probably to the digitonin promoting the circulation and nutrition of the heart muscle. The persistence of the action of digitalis will vary, depending upon the amount absorbed and fixed in the tissues, which amount depends upon the elimination being less than the absorption.[3]

Some cases after full doses of digitalis may require ten to fourteen days before all evidence of the digitalis effect disappears. There need be no fear of cumulative effect of digitalis when given by the mouth in doses to control fibrillation.

[1] Jour. Pharm. and Exper. Therap., 1912, iv, 113, and Jour. Am. Med. Assn., 1913, ix, 499.

[2] Jour. Pharm. and Exper. Therap., 1913, v, 1.

[3] Hatcher, R. A.: Arch. Int. Med., 1912, x. Eggleston, C.: Jour. Am. Med. Assn., 1912, lix, 1352.

The first case demonstrates how promptly strophanthin intravenously can reduce the ventricular rate in fibrillation of the auricle, and how that rate subsequently can be controlled by digitalis.

CASE I.—M. Q., aged thirty-two years, married, admitted complaining of palpitation, shortness of breath, vomiting, and swollen legs. Her family history is irrelevant. As a child she had measles, chicken-pox, typhoid, and at fifteen her first attack of rheumatism. She had three children and no miscarriages, and seven months before admission her last child was born. Six months before admission she had pneumonia, since which time she has been short of breath on exertion. Five days before admission her feet swelled, the amount of urine diminished, and her heart began to palpitate. On examination she was cyanotic, orthopneic, gasping for breath, with paroxysms of coughing and at times vomiting; her legs were greatly swollen and her back up to the dorsal region was edematous; the pulsating liver was enlarged to the level of the umbilicus and the lungs had coarse and fine rales up to the level of the angles of the scapula. The apex of the heart was felt in the sixth space 13 cm. to the left of the midline, and the action was grossly irregular and tumultuous, with ventricle contracting at the rate of 135 to 150 per minute (Fig. 1); the count at the wrist was only 80 per minute, a deficit of 50 to 70 per minute. Ten hours after admission an intravenous injection of crystalline strophanthin, 0.5 mg. was given. Half an hour later she was breathing quietly and could lie on three pillows with comfort. Digipuratum, four tablets per day for five days, were given until the ventricular rate decreased to 85 per minute. Four days later, as the rate of the ventricle increased, she was given ½ ounce of the infusion twice a day. While taking this amount of the infusion the edema diminished, the urine increased in quantity, and the heart frequency was controlled. She regained her strength and left the hospital. To control (Fig. 2) the heart rate, however, it has required the continued use of a maximum daily dose of three-quarters of an ounce of the infusion of digitalis. With this dose she is able to be about the house doing light tasks, but diminishing or discontinuance of the dose means immediate distress and disability. The need of continuing for the remainder of life such a dose of digitalis as will control the heart rate must be emphasized, for in cases with fibrillating auricles this point is very often neglected, and after a short interval without digitalis these cases return in great distress. The neglect to prescribe or use digitalis in this manner occurs not only in hospital and dispensary but also in private practice, and the withholding seems to be due to ignorance of the necessity for the continued action of the digitalis. Each case must be tried out to discover the amount of the particular preparation of digitalis which will be required to control the heart action. Not only does

the strength of the preparations of the tincture or infusion made by different firms vary, but it must always be borne in mind that each individual reacts in a different degree to the same preparation,

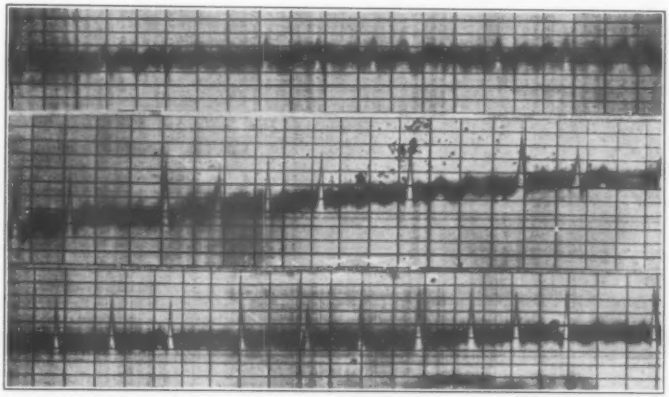

FIG. 1.—Case I. M. Q., taken June 16, 1914, before strophanthin was given, shows auricular fibrillation, with a ventricular rate of 140 to 150 and a positive or upward directed *T*-wave in lead II.

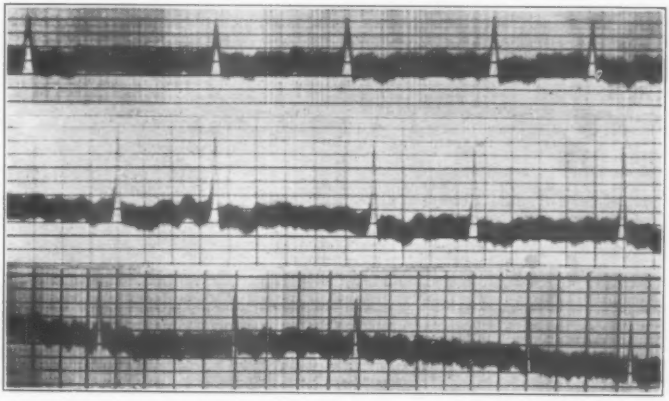

FIG. 2.—Case I. M. Q., taken November 19, 1914, shows the slower rate of the ventricle to be 80 to 90, though the auricle continues to fibrillate. The slower rate is maintained by digitalis, the second effect of which is shown by the negative or downward-directed *T*-waves of lead II.

and therefore it follows that the two variables of patients and preparations must be tried out.

The regulation of the ventricular rate is brought about by the action of digitalis on the mechanism conducting the impulses to contract over the auriculoventricular muscle bridge or bundle of

His. Two demonstrated facts show that a great part, if not all, of its inhibiting effect is due to stimulation of the vagus nerve endings in the auriculoventricular bundle: (1) pressure[4] on the vagus in the neck can slow the rate of the ventricle, and (2) atropin can release the ventricle from the digitalis effect and permit the ventricular frequency to increase. When the heart muscle is only moderately damaged the increase from atropin may be as much as two or three times the slow rate, while in arteriosclerosis of marked degree the atropin may produce little or no effect unless huge (0.1 grain) doses are used. Digitalis produces or increases the functional heart block. From experimental work on the lower animals[5] there is evidence to point toward disturbances of the functions of contractility and conduction of the heart muscle as the cause of fibrillation, by which term is understood that condition of the auricular muscle in which the separate muscle fibers contract individually and not with coördination; the auricle remains in diastole while its walls quiver with the fibrillating muscle fibers. The numerous and rapid contractions of the auricular muscle send rapidly recurring impulses to the auriculoventricular bundle, by which they are transmitted to the ventricle, and digitalis reduces the rate at which these impulses are conducted and delivered to the ventricle; but judging from the electrocardiograms it has little or no effect on the fibrillation rate of the auricular muscle. On the rate of normally rhythmic heart, little or no effect is produced by therapeutic doses of digitalis; but in the condition of fibrillating auricle, digitalis usually produces a very prompt and profound effect. So certain and dependable is this reaction of the inhibitory mechanism of the heart to digitalis that its absence in cases of fibrillation should be interpreted as insufficient dose, inactive preparation, or extensive muscle damage. It is one method of physiologically testing the sample of digitalis.

The second case is one of fibrillation, which under a brief treatment by digitalis returned to normal sequential rhythm.

Case II.—R. M., aged fourteen years, had measles and many attacks of tonsillitis. For two years she had heart trouble, but came to hospital for an attack of only seven weeks' duration following "catching cold." Examination showed a girl with marked orthopnea, cyanosis, and vomiting at intervals; heart very much enlarged, with the apex in the left axilla sixth space, and consolidation of the left lower lobe; a pericardial friction rub could be heard over the precordium, and in the back the interesting phenomenon was noted that the friction sound could be heard through the consolidated lung; the liver was palpable 4 cm. below the free border of the ribs. The fibrillation of the auricle was revealed by

[4] Robinson, G. C., and Draper, G. J.: Exper. Med., 1911, xiv, 217.

[5] Mines, G. R.: Jour. Physiol., 1914, xlvi, 349. Levy, A. G.: Jour. Physiol., 1914, xlix, 54.

the gross irregularity of the heart rhythm and (Fig. 3) taken March 29, 1915. She was given a small amount of morphin to make her comfortable, as she was suffering considerable pain from the pericarditis, and next day strophanthin, $\frac{1}{75}$ grain twice a day

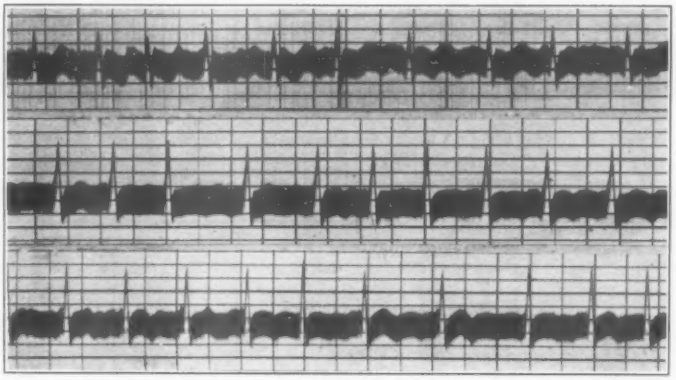

FIG. 3.—Case II. R. M., taken March 29, 1915, before digitalis effect obtained, shows the auricle fibrillating with a ventricular frequency of 157 to 170 and the *T*-waves of lead II upward or positive in direction.

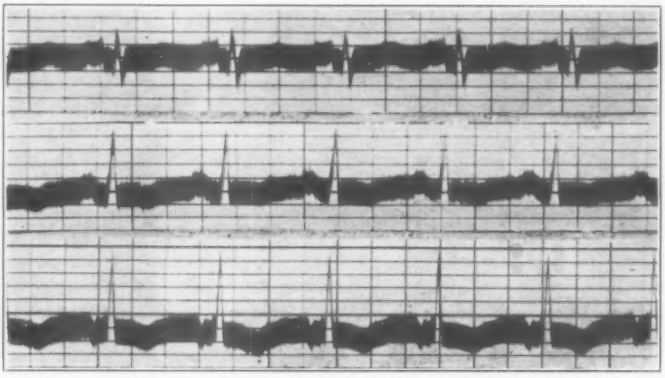

FIG. 4.—Case II. R. M., taken April 2, 1915, after digitalis was given, shows the auricle and ventricle contracting in normal or sequential rhythm at the rate of 100 and the *T*-wave of lead II is frankly negative or downward.

hypodermically. On the fourth day, because of nausea, she was given tincture of digitalis, 30 minims in milk (120 c.c.) as a rectal enema and repeated every four hours. After eight doses the ventricular rate slowed to 100 per minute and the rhythm suddenly became regular and sequential, as shown by Fig. 4, and the digi-

talis was discontinued. By sequential rhythm is understood the coördinate contraction of the auricles, followed after a definite period by the contraction of the ventricle. Once the auricle has begun to fibrillate it most commonly continues to fibrillate for the remainder of life. Rarely one may see attacks of paroxysmal tachycardia which prove to be either fibrillation or flutter and the normal rhythm be undisturbed after the attacks.

The third case is one of auricular flutter, which was altered to fibrillation by strophanthin and controlled by digitalis.

CASE III.—L. M., aged forty-two years, married, referred to me by Dr. L. Kast. As business manager of a successful London theater he was for many years under great responsibility, and it was while traveling for professional purposes in this country that he came under observation. He had always used alcohol more or less frequently in excessive amounts, and he began to smoke tobacco at fourteen. In other respects he enjoyed excellent health and denies having had veneral disease. When sixteen years of age he had his first attack of acceleration and palpitation of the heart, accompanied by shortness of breath. The first attack and others were ushered in and terminated by a sudden "thump" of the heart. The attacks frequently followed the eating of a large meal, and then would be relieved by vomiting. When the attacks occurred at other times he thought they were terminated by such procedures as holding his breath, belching, a drink of brandy, or formalyptol, very hot poultices applied to the chest, or in several instances by the jarring of a taxicab over a rough pavement. Frequently the attacks would cease during sleep. One week before he was first seen, and compelling him to terminate a hard business trip, the attack of which we have the records, began with palpitation so vigorous as to shake him visibly; the least exertion brought on great distress in breathing, and there was pain and tenderness to pressure in the epigastrium and right hypochondrium. Examination showed a man, moderately cyanotic, sitting in bed breathing quietly but frequently; the body shaken by the vigor of the heart beat. There was very slight dulness and numerous fine rales over the bases of both lungs behind. The liver was tender to pressure and the edge could be felt at a point 5 or 6 cm. below the free border of the ribs. There was no edema of the legs or ankles. The ventricular frequency was about 175 per minute and regular; the electrocardiogram (Fig. 5), showed auricular flutter, with two to one heart block. Four days later, because increasing dyspnea, pulmonary edema, cyanosis, epigastric pain, and edema of the ankles indicated an increasing heart failure, an intravenous injection of $\frac{1}{75}$ grain of crystalline strophanthin was given. Within an hour following this dose the mechanism of the heart changed to fibrillation, record No. 386 (Fig. 6), with the ventricular rate of 115 to 130. Six days later, and before digitalis by mouth became effec-

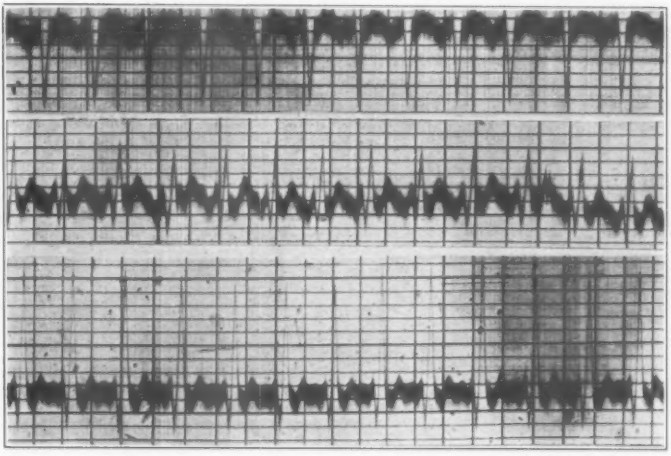

FIG. 5.—Case III. L. M., taken April 10, 1914, before digitalis was given, shows the rapid contracting auricle and ventricle of "flutter" at 175 per minute.

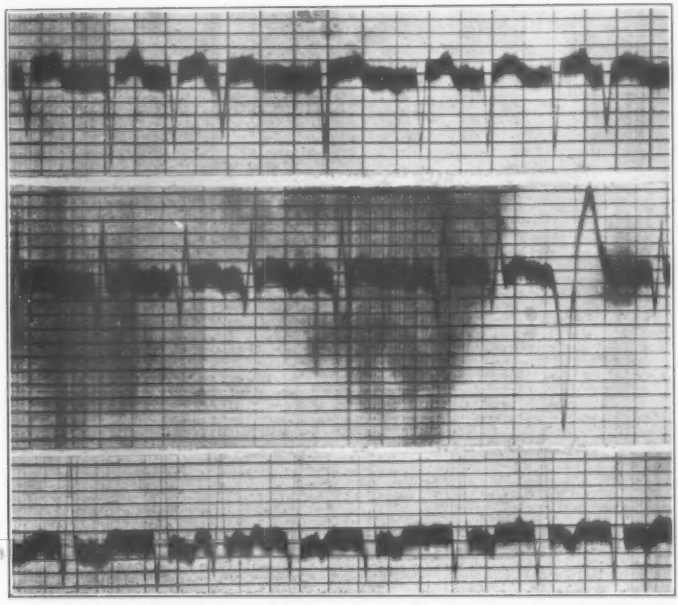

FIG. 6.—Case III. L. M., taken April 14, 1914, after strophanthin had been given and auricular fibrillation produced with a rate of approximately 115. The *T*-wave lead II in upward negative.

tive, the ventricular rate increased to 155 to 172, though the fibrillation persisted (Fig. 7). Under digipuratum the heart rate gradually

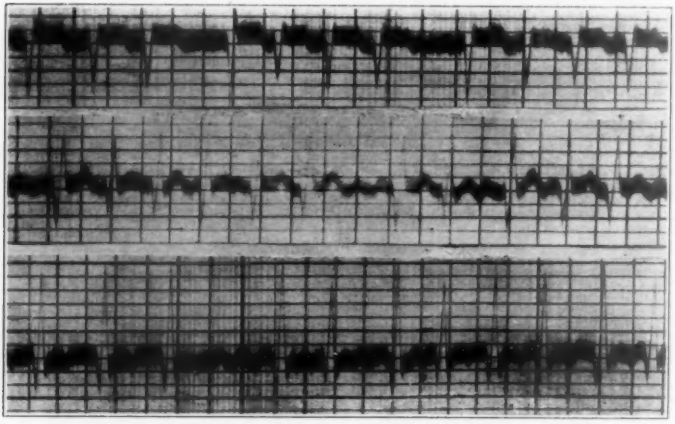

FIG. 7.—Case III. L. M., taken April 17, 1914, before the digitalis given by mouth had become effective, the ventricular rate increased to 155 to 172 per minute, but the auricular fibrillation persisted.

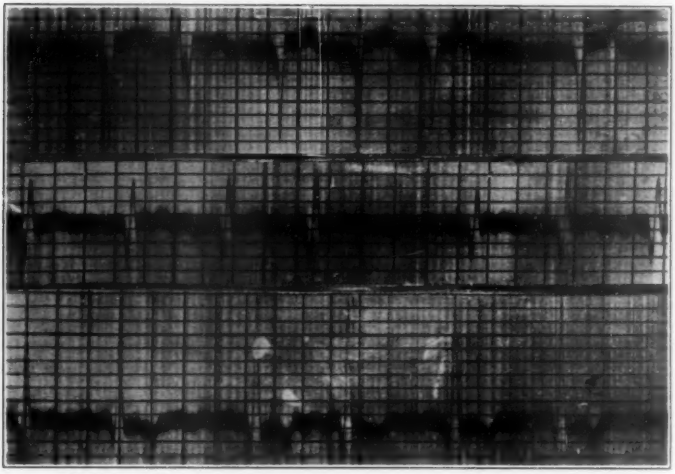

FIG. 8.—Case III. L. M., taken April 24, 1915, after the digitalis became effective, shows the ventricular rate to be about 85 per minute, with fibrillation present.

came down to 85, where it was maintained, though the fibrillation remained (Fig. 8).

CASE IV.—O. C., aged sixty-five years, was seen for the first time nine days after the removal of his prostate by Dr. J. Bentley Squier. Four days previously his heart had become very rapid and digalen in 10-minim doses, three times a day, had failed to produce any effect on the rate or rhythm. He was short of breath, restless, and conscious of the rapidly and energetically beating heart. He had the pallor peculiar to the arteriosclerotic, chronic nephritic prostatic. The blood examination showed 5,136,000 red cells; 6800 leukocytes; 55 per cent. hemoglobin. The phthalein test showed an output of 60 c.c. of urine in two hours, containing 49 per cent. of the drug.

There was an indeterminate history of rheumatism at thirty-five years of age, but otherwise his history was negative. Before operation the pulse was 88, and subsequently it was 96 to 100 until the high rate noticed on the fifth day.

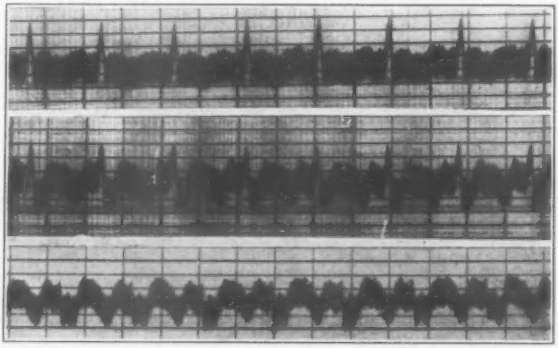

FIG. 9.—Case IV. O. C., taken February 18, 1916, shows auricular flutter at 320 per minute, two to one heart block and ventricle at 160 per minute.

The apex was in the fifth space 10 cm. to the left of the midline. The ventricular rate was about 160 per minute while the count of the radial was 120, thus showing the deficit of 40 beats. The lungs were clear and the liver edge was palpable and tender to pressure.

The electrocardiogram showed the auricle to be in flutter at the rate of 320 per minute, while because of a partial block of 2 to 1 the ventricular rate was 160 per minute (Fig. 9).

The tincture of digitalis in 30-minim doses every four hours was given, and two days later the auricles were in fibrillation, with a ventricular rate of 104 (Fig. 10). The digitalis was continued, and two days later the ventricular rate was 76 (Fig. 11). Because of the sense of nausea being rather severe he refused to continue the digitalis for four days, when the increasing commotion of the fibrillating ventricle caused him to be persuaded to try the tablet

of digipuratum, two tablets every four hours. The rate of the ventricle came down, and four days later the auricle became regular at 72 per minute, with the ventricular contraction following every beat at a time interval of 0.2 second (Fig. 12).

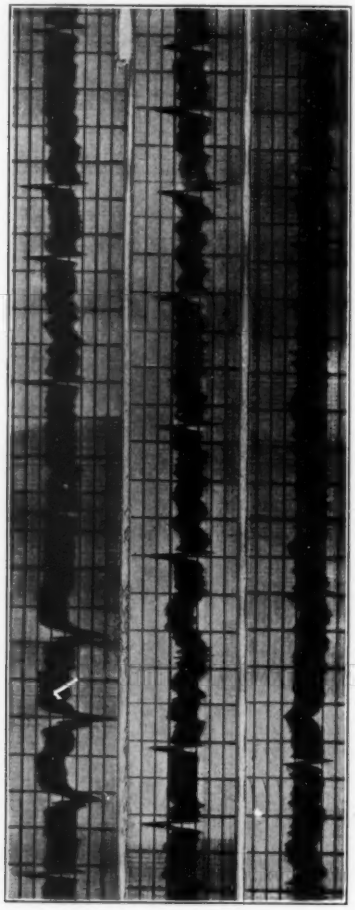

FIG. 10.—Case IV. O. C., taken February 19, 1916, shows fibrillation of auricle with ventricular rate of 104.

Many cases of flutter have been reported which have been changed to fibrillation, and subsequently, after slowing by digitalis, have resumed their normal sequential rhythm. This is the aim and hope of the procedure.

The employment of digitalis to effect the rhythm as shown in these cases should not permit us to forget that such use depends

on the accurate diagnosis of the condition. If there is doubt as to the cause of pulse frequency one should hesitate in the administration of such doses of digitalis, for the production of fibrillation

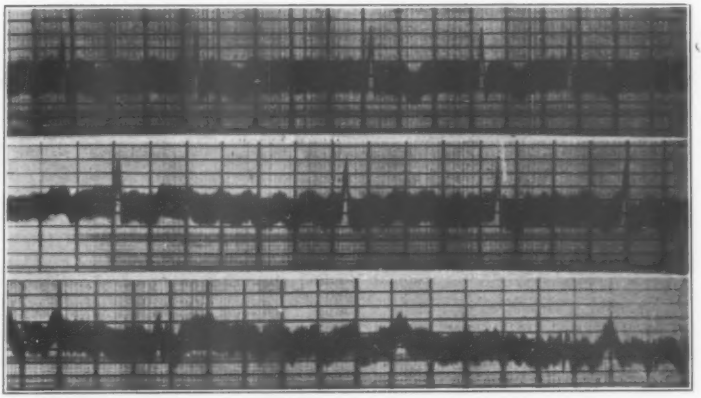

FIG. 11.—Case IV. O. C., taken February 21, 1916, shows fibrillation with ventricular rate of 90.

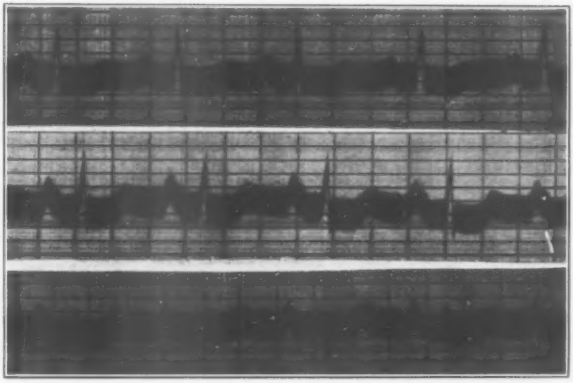

FIG. 12.—Case IV. O. C., taken February 29, 1916, shows sequential rhythm, with conduction time of 0.2 sec. *T*-wave in lead II downward. *S*-wave of lead III taken in conjunction with *R*-waves of leads I and II, showing hypertrophy of left ventricle.

in an otherwise healthy heart would not be desirable nor justifiable. With proper precautions we may draw the following conclusions:

1. The gross irregularity of the ventricle in cases with fibrillation of the auricle can be controlled by digitalis if sufficient drug is exhibited.

2. The patient should be instructed to continue the use of digitalis for the remainder of life, and should be taught how to determine the amount of the dose necessary from day to day to control the heart rate. Give sufficient drug to maintain the rate of the ventricle below 70 per minute when counted after a rest in the late afternoon.

3. The fibrillating auricle under a short course of digitalis may return to normal rhythm.

4. In auricular flutter the aim of treatment with digitalis is to produce auricular fibrillation and then control the rate of the ventricle with digitalis, hoping in the favorable cases for a renewal of normal sequential rhythm.

SYPHILIS OF THE LUNG.*

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Claytor,[1] in 1905, made the following statement: "Whether we agree with the majoirty who hold that syphilis of the lung is rare in the adult, or with the few who consider it more common, we all must accept the opinion of the best authorities that the condition does exist. Now when it is taken into consideration that syphilis is curable and that the advanced cases of pulmonary tuberculosis, with which it is likely to be confounded, are as a rule, incurable, one should be all the more careful to make no mistakes." This in brief is the chief reason for reviewing the subject; not so much for the purpose of presenting a few cases that have perhaps some academic interest, but chiefly in the hope that by constantly bearing in mind that syphilis of the lung does occasionally occur, we may by correct diagnosis and intensive treatment save a life that might otherwise be lost. As Virchow[2] said: "Some patients die of so-called tuberculosis for lack of antisyphilitic treatment."

The question of its frequency or rather rarity is of some interest, in that considerable divergence of opinion has existed from time to time. This disagreement has not depended entirely upon the personal judgment of the individual author, but has reflected rather closely the development of clinical medicine.

Historical. A survey of the abundant literature can be conveniently divided into three historical epochs:

1. A long period, beginning with Paracelsus in 1500 and ending with Laennec in 1800.

* Read before the San Francisco County Medical Society and before the University of California Hospital Medical Society.

2. The second period commenced with the pathological investigations of Depaul[3] and Virchow[2] in the first half of the nineteenth century and ended with the observations of such clinicians as Fournier,[4] Lancereux and Dieulafoy[5] at the beginning of the twentieth century.

3. The third period covers the last ten years, and includes the discovery of the Spirocheta pallidum, the complement-fixation test of Wassermann, the introduction of salvarsan by Ehrlich, and the extensive use of the roentgen rays in the interpretation of pulmonary disorders.

Fournier[6] speaks of the first epoch as the period of obscurity. These three hundred years included the most fanciful conceptions, utterly lacking in precision, unfounded in any accurate research. It sufficed in those days, for a pulmonary affection to follow a venereal infection, whether gonorrheal or syphilitic, for the pulmonary lesion to be declared of venereal origin. Cases were seriously reported in which the suppression of a gonorrheal discharge was followed by a so-called venereal pthisis, which in turn vanished upon the reappearance of the urethral discharge. In comparing the large number of cases of pulmonary syphilis reported during these three hundred years with the comparatively small number reported in the last one hundred years, the elder Fournier speaks of "the credulity of our fathers and the incredulity of our contemporaries." In fact, there existed in this older epoch absolute confusion, a few simply believing in a predisposition on the part of syphilitics to contract phthisis, while the greater number firmly believed in a real venereal phthisis, identical in signs and symptoms with all other phthises, but differing as to cause. Laennec, however, in differentiating pulmonary tuberculosis as a distinct disease, opened the way to the recognition of a true pulmonary syphilis.

The second period produced careful scientific investigations. First came the macroscopic observations of Depaul,[3] in 1837, of a condition in the newborn which Virchow,[2] in 1858, described histologically and called pneumonia alba. Subsequently the various forms in the adult were accurately described from a pathological stand-point, and probably we know but little more today of the picture at autopsy than was known fifty years ago. After the introduction of the stethoscope, and finally with the discovery of the tubercle bacillus, clinical observations became more precise and reliable. The general result of this scientific period was the conviction that pulmonary syphilis was a clinical entity, but that it was far less common than had been hitherto supposed. The only question in dispute was its actual rarity. Was it merely uncommon or was it really a rare medical curiosity?

In autopsies upon 97 cases of acquired syphilis, Chiari discovered one case of syphilis of the lung. Peterson,[7] in 88 autopsies of acquired syphilis, found 11 cases of pulmonary syphilis. In 1884 Hiller[8]

collected reports of 84 autopsies showing syphilis of the lung, but Councilman[9] regarded only 28 of these as definitely syphilitic. On the other hand, Fowler,[10] in searching through all the London museums, found only 12 cases, while in 1905 the Army Medical Museum at Washington, consisting of 13,000 specimens, did not contain one instance of this disease.

Certain groups of clinicians, however, considered the disease much more common than generally supposed. Satterthwaite[11] thinks that lung syphilis is greatly underestimated by the general practitioner and "almost unknown to many syphilographers." Pankritius,[12] who in 1881 wrote one of the most important monographs on the disease, with a very complete review of the literature, found it by no means unusual; likewise other German authors, as Schnitzler[13] and Grandidier,[14] and of the French clinicians, Fournier,[4] Lancereux and Dieulafoy.[5] On the other hand, clinicians of a more strictly pathological bias still insist upon the rarity of pulmonary syphilis. Thus Osler,[15] in twenty-five years' experience, cannot recall above half a dozen. Stengel[16] suggests that this difference of opinion depends largely upon the point of view of the observer, whether as a clinician or as a pathologist, the former believing that this condition is comparatively common, the latter that it is very rare. This may be due in part to the failure of the pathologist to recognize syphilis. It is by no means simple to differentiate between pulmonary syphilis and pulmonary tuberculosis not only at the bedside but in the pathological laboratory. As Claytor[1] says: "The only absolutely certain point of difference in many cases is the presence of the tubercle bacillus, and even this unquestionable evidence of tuberculosis does not preclude the possibility of associated syphilis. Pulmonary tuberculosis is so common, and syphilis of the lung thought to be so unusual, that it seems probable that some of these cases, because of their very rarity, may slip by with a diagnosis of tuberculosis. Many cases of supposed phthisis give such a typical history and show such characteristic signs of the disease that it does not seem necessary to examine the sputum, or even if the bacilli are not found on a few examinations no change in the diagnosis seems called for. The same line of argument is used in the post-mortem room. The condition is so much more likely to be tuberculous than luetic and so difficult to distinguish from it that it is almost always placed in that class unless pronounced syphilitic lesions of other organs are discovered." It may be mentioned again that this whole problem would merely resolve itself into the satisfaction connected with a correct differential diagnosis if it were not for the tremendous practical importance to the patient of such correct diagnosis.

When we come to consider the third epoch in our knowledge of pulmonary syphilis it would seem at the outset that a solution of the difficulties was at hand. But such is not the case. To my

knowledge, Schaudinn's Spirocheta pallidum has not been found in the sputum expectorated by pulmonary syphilitics, and would be with difficulty differentiated from the numerous spirochetes normally inhabiting the mouth. It likewise remains for someone to find these organisms with any frequency at autopsy in the lungs, as Warthin, for instance, found them in the myocardium. Such an investigation of a large series of autopsies upon syphilitics would, I think, go far to dispel the prevalent ideas as to the rarity of lung syphilis. It might have been expected that the Wassermann reaction would be of considerable assistance. But this is frequently not the case. Negative Wassermanns in syphilitics are by no means uncommon, and a positive Wassermann merely indicates that the patient has syphilis but not that the pulmonary condition is luetic. However, in those cases in which history signs and symptoms are all lacking, a positive test may at least lead to a suspicion that the phthisis has a specific etiology. It might have been hoped that the roentgen rays would give us some sort of characteristic picture which would permit of definite recognition. However, roentgenographs are disappointing in the sense that they do not provide us with an exclusively unique picture. But they are of value in a negative sense, for they decidedly help to exclude pulmonary tuberculosis. The roentgen-ray plate of a luetic lung is quite unlike that of a Koch infection, but it is not unlike many other pulmonary conditions, all of which result in peribronchial thickening. Gummata do present striking shadows, but have to be differentiated from malignant growths. We may conclude then that even today our knowledge of pulmonary syphilis and our ability to diagnose it leaves much to be desired.

PATHOLOGY. In a general sort of way one can classify the lesions anatomically into three groups:

1. The formation of gummata.
2. Those cases in which changes in the connective tissue predominate.
3. Those cases where alterations of the parenchyma predominate.

Combinations and modifications of these may occur, but the changes just mentioned represent the principal types of lesions in acquired syphilis of the lung.

The gummata may be single or multiple, vary in size and shape, and occur in any part of either lung. Some authorities have attached peculiar importance to the frequency of such gummata in the middle lobe of the right lung, and attempted to establish this point as a useful means of differential diagnosis. This does not seem entirely justified by a critical review of many cases recorded by many different authors; nor does it seem reasonable to suppose that this particular portion of the lungs should be a site of predilection, though it must be admitted that different bacteria select special organs with extraordinary constancy. The very fact that such a protean disease

as syphilis so rarely attacks the lung when spirochetes in large numbers must circulate through the lung in the blood stream is evidence enough of this selective characteristic. The gummata resemble those found elsewhere in the body and may readily be mistaken for tubercles. Though different details of the histological picture have been advanced as points of differentiation, the presence of the tubercle bacillus is the only final proof.

The second group comprises those cases in which fibroid induration is the outstanding feature. This is essentially a chronic process, and Pankritius considers this primary proliferation of the connective tissue in lung syphilis as characteristic of lues, for in other diseases of the lung which have hyperplasia of the connective tissue it is secondary to some primary condition, such as the chronic pneumonia of stonecutters and grinders. Virchow[2] considered the condition like the specific inflammations of the liver and testes.

The implication of the parenchymatous structures in lung syphilis was emphasized by Councilman.[9] This is essentially a pneumonia with fibrinous exudation.

Symptomatology. The onset of pulmonary syphilis is very insidious, very slow, latent, and usually entirely ignored and unrecognized. Fournier compared it in its stealthy beginnings with the lack of symptoms from a gumma of the hard palate. The patient rarely realizes that there is anything abnormal in his mouth until perforation occurs and liquids regurgitate through his nose. This is in striking contrast to the rich and varied functional disturbances of a pulmonary tuberculosis at a similar stage of development. The symptoms of pulmonary tuberculosis are due to two causes: On the one hand tuberculous intoxication, upon which, for example, the anemia depends; on the other hand the symptoms due to reflex action of the pneumogastric (Pottenger), namely, cough, the tachycardia and gastric disorders, etc. And, moreover, these two disturbances, the general and the local, are usually associated. This is not the case in early pulmonary syphilis. The process must be far advanced before any change in the general health is noticeable. The patient preserves an appearance of strength, his complexion and color are good, his facies normal, his appetite remains, and he holds his weight fairly well. In fact, it is exceptional for syphilis to produce phenomena of general intoxication in any way comparable to the severity of the lesions from which the patient is suffering, even though these be enormous destructive ulcerations. Syphilitics do lose weight and appetite, become weak and enfeebled, but by no means to the same degree as would a tuberculous individual in the same stage of the disease. It is also worthy of note, according to Fournier, that whereas mediastinal adenitis is constantly present in early pulmonary tuberculosis, it is almost always absent in early pulmonary syphilis. This corresponds to the lack of regional adenitis in most tertiary lesions. As a result the reflex action of the

pneumogastric are not excited and the usual symptomatology of early tuberculosis does not occur. If cough does occur in an early pulmonary lues it is probably due to laryngeal, tracheal, or bronchial lesions. But as the gummata, fibroid or parenchymatous processes increase, functional disturbances will arise, and these are mostly dyspnea, cough, and expectoration.

Dyspnea is quite common. In some cases it may be due to a complicating stenosis of the bronchi or trachea. It is frequently very severe.

Neither the cough nor the sputum have anything characteristic about them. The cough is often spasmodic, like the dyspnea. The sputum may be little in amount, or very abundant, purulent, greenish, and of foul odor from bronchiectatic cavities. In an uncomplicated case, repeated examinations will consistently be negative for Koch's bacillus. Elastic tissue may be present from destruction of lung tissue. In fact, pieces of a gumma may be coughed up through a bronchus, as in the case reported by Cube.[17]

Hemoptyses are less common than in tuberculosis, probably due to the chronic obliterative endarteritis, but they do occur. Blood-streaked sputum is not unusual.

Night-sweats and pyrexia are the rule, though the fever seems to be more variable in character than in tuberculosis.

Loss of weight always follows as the disease progresses, but usually to a less degree than in tuberculosis. Emaciation is exceptional, but may be pronounced.

The physical signs are in no way characteristic, are identical, in fact, with tuberculosis. It is said that necrosis and softening is rarer in gummata than in tubercles, and it is the general opinion that cavities do not occur as frequently in lung syphilis; but cavities unless large are usually missed clinically or diagnosed when they are not present, so that this point will not be of much assistance in reaching a diagnosis. In a general way one might say that syphilis of the lung is more frequently unilateral, more often circumscribed, and does not show the same predilection for the apex of the lung as does tuberculosis. But all these points are of meager value in forming a conclusion, and it may be noted that recently Landis and Lewis[18] called attention to a latent type of pulmonary lues confined to the apices, in every way simulating early tuberculosis.

Diagnosis. The Wassermann test, as said before, is helpful, if positive, in directing attention to the idea that the pulmonary lesion may be luetic, but merely signifies that the patient has lues; if negative it has no value one way or another.

Luetic lesions elsewhere or a clear history of primary secondaries or other luetic stigmata may make one suspicious.

There are really but three points in the diagnosis that seem to be of any help:

1. The absence of tubercle bacilli on repeated examinations.

2. The curious lack of proportion between the gravity of the physical signs, the severity of the symptoms, and the astonishingly good appearance of the patient.

3. Merely bearing in mind in the examination of every suspected pulmonary tuberculosis that there exists such a curable lesion as lues of the lung.

PROGNOSIS. Balzer[19] said, rather neatly, that the prognosis for a patient suffering from lues of the lung depended upon the intuition or clairvoyance of his physician. If the condition is recognized the treatment is simple, startling in its results, in some cases almost miraculous. Even patients that have been reduced to a state of great enfeeblement and cachexia, whose condition would appear to be desperate, are restored to normal in an astonishingly short time. To be convinced of this one need but read some of the cases so dramatically described by Fournier, in which the cures were quite spectacular. Our results today should be even more brilliant, for with the wider adoption of accurately controlled mercury injections, instead of haphazard inunctions* or mouth medication, and with the addition of salvarsan we have more powerful remedies than did Fournier. There is no necessity for considering the treatment. It is simply the intensive treatment of syphilis, consisting of intramuscular mercury salicylate injections, intravenous old salvarsan, and large doses of potassium iodide. Salvarsan seems to be specially prompt and efficient in this condition.

If the disease is not recognized death will result in the majority of instances from general weakness or lesions in other viscera. Pulmonary syphilis develops slowly, much more slowly than tuberculosis, though cases like "galloping consumption" have been reported. A few cases will undoubtedly regress spontaneously without any treatment, as is characteristic of syphilitic lesions elsewhere. Lung syphilis may open the door to pulmonary tuberculosis and thus cause death indirectly, and this leads to a brief consideration of the association between these two diseases.

ASSOCIATION WITH TUBERCULOSIS. When the frequency of lues of the lung is brought up for discussion, generally the first remark made by those who are very conservative is this: Syphilis and pulmonary tuberculosis are both extremely common; is it not to be expected that both may frequently coexist in the same individual? Why, then, when pulmonary lesions develop in a syphilitic should one be suspicious of syphilis of the lung when pulmonary tuberculosis is incomparably more common! This reflection is not only correct but is supported by the well-recognized fact that the congestion, erosions and ulcerations of the mouth, pharynx, larynx and trachea, so common in secondary syphilis, actually predispose

* Mercurial inunctions properly and conscientiously administered by a nurse or attendant, are potent and efficient. Objection is raised above to the "rubbing" done by the average patient at home.

to the development of consumption. Laryngologists have repeatedly warned us of this possibility. Though the laryngitis is syphilitic at the outset a tuberculous process is sometimes engrafted upon it, and though specific therapy will cure the syphilitic lesions the tuberculous laryngitis remains. Potain[20] likewise called attention to the probability that the syphilitic bronchitis, so common in the secondary stage, may in a similar manner open the door to the tubercle bacilli.

Syphilis of the lung and tuberculosis of the lung may occur together, and in those few cases in which this simultaneous involvement has occurred, antiluetic treatment would seem to have cured the syphilitic lesions, while the tuberculous portion continued to develop.

The association of pulmonary tuberculosis and syphilis (I am refering now to syphilis in general, not lung syphilis) may obviously take place in two ways: a tuberculous individual may acquire syphilis or a syphilitic may become infected with pulmonary tuberculosis. When syphilis attacks a patient already ill with consumption the pulmonary tuberculosis is aggravated and pursues a more rapid course.

When tuberculosis appears in a syphilitic the development of the tuberculosis would seem to depend upon the interval that had elapsed since the primary lesion, the chancre. In other words, when tuberculosis is added to an active, recent virulent syphilis the tuberculosis pursues a more rapid march, the co-called galloping type. Chretian[21] injected two guinea-pigs with the blood of syphilitics in the secondary stage and then inoculated them with tubercle bacilli. These pigs died much sooner than the control pigs who had merely been inoculated with the tubercle bacilli. Though not to be regarded as experimental proof, still this observation is in accord with clinical experience.

But when tuberculosis develops in a patient whose syphilitic infection occurred over six years before, the tuberculosis pursues a mild, slow course without pyrexia and tending to the chronic fibrous type. Stieffel[22] assembled some statistics which demonstrated this point quite strikingly, the longer the interval after the chancre the milder the tuberculosis.

Abstract of Cases. Case I.—The first patient was a married man, aged thirty-eight years, who came to the out-patient department of the University of California in August, 1914.

Family and Marital History. His family history does not concern us except to note that there was no history of tuberculosis. He reported his wife in good health, likewise his two children; no miscarriages.

Past History. Two years before coming to us he had a lump on his right parietal bone, which was removed. Wassermann at this time was negative. He probably had his initial lesion sixteen years

before, though he spoke of it as a soft chancre; no history of secondaries; no antiluetic treatment. Otherwise his past history is unimportant.

Present Illness. Two years before we saw him the patient began to cough, apparently a dry irritative cough, without expectoration. During this time he was a street car conductor and thought that the fog and night air caused the cough. One year ago while working at night as a guard at San Quentin prison, his present occupation, the cough began again; no hemoptyses or sputum. He had pleurisy twice on his right side during this time, without effusion. (It might be said in passing that some of these so-called right-sided pleurisies

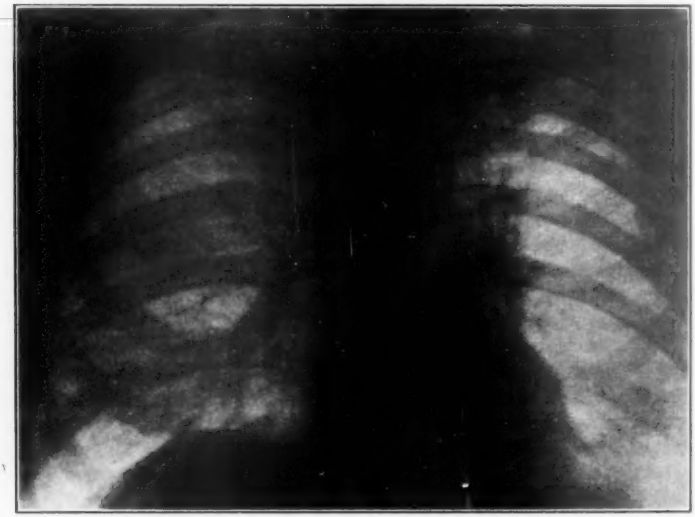

FIG. 1.—Roentgenogram of Case I, taken before treatment. Extensive dense root shadows and diffuse peribronchial thickening extending well out to the pleura.

in luetics are caused by a periphepatitis.) He then began to lose weight and strength, felt tired constantly, and during the three weeks previous to August, 1914, suffered from drenching night-sweats. The patient lost thirty-five pounds during this last year. In this case there was no sputum to examine.

Physical Examination. The patient was by no means emaciated despite this great loss of weight. On the contrary he was a large, muscular man, and the weight he lost was probably surplus fat. He looked well, was well nourished, and did not give the impression of being afflicted with a severe illness. A depression was noted on the right parietal bone, the site of the excised lump previously mentioned. Otherwise no evidence of past or present lues was discovered.

His lungs were likewise almost normal, slight narrowing of the right apex, with harsh breathing, being the only abnormality. His roentgen-ray plate is shown in Fig. 1. The Wassermann, August, 1914, was positive, three plus.

Since he resided at San Quentin and could not come with great regularity our routine therapy was not employed. He received nothing but four full doses of Old Salvarsan intravenously in the course of the following six weeks. August 21 his weight was 172 pounds, a gain of 20 pounds. His night-sweats disappeared permanently two days after the first salvarsan; his cough was markedly ameliorated and ceased entirely after the second salvarsan. After the last salvarsan he remained away, feeling too well to return, so one year later, October 3, 1915, I went over to San Quentin to see him and found him in robust health, having gained 30 pounds more, so that his weight was 220 pounds, 50 pounds more than before treatment. He has not had any return of his cough or night-sweats.

Case II.—The second patient was a young married woman, aged twenty-two years. No family history of tuberculosis. She had been married twice; no pregnancies during her first marriage; she married her second husband one and a half years ago, had one three months' miscarriage, and a child, who is now eight months old, apparently well with no stigmata of congenital lues and with a negative Wassermann.

Past History. This contains the following item of interest. Two and a half years ago, during her first marriage, she became blind for two months, and her physician gave her an injection into the left buttock which cured her blindness but resulted in an abscess. This is not absolute evidence of syphilis by any means, but it does raise the suspicion of a luetic iritis cured by an intramuscular injection of salvarsan. She has no knowledge of a primary lesion or of a secondary manifestation.

Present Illness. She came to the clinic in September, 1915. Six weeks previously she had a hard cold with fever and chills, was sick in bed two days, coughed, and raised abundant quantities of thick yellow, bloody sputum. She had night-sweats then. The cold continued, and during the month before we saw her, grew worse. She lost her appetite, became increasingly weak; suffered greatly from dyspnea and daily chills and fever, and had spasmodic coughing spells, when she could not stop coughing for half an hour. During these six weeks she lost 6 pounds, 13 pounds in the previous three months, prior to September. She began to have pains in her chest on both sides, of pleuritic character. No hemoptyses.

Physical Examination. The patient made a curious impression. She looked ill; her face was flushed; her temperature was 103°; pulse 130; respirations 60 to the minute; had frequent violent spells of coughing, very exhausting, which interrupted the examination for several minutes on several occasions. And despite all this she

was by no means emaciated. She was slender, perhaps, and weighed 125 pounds. Supra- and infraclavicular fossæ were well filled out; her chest was well formed. Excursion of the lungs was very limited on both sides. There was dulness at both apices, front and back, more marked on the left, and the percussion note was impaired over both lungs over the entire back. The breath sounds were very harsh and coarse, approaching bronchial breathing, with coarse bubbling rales, especially on the left. A friction rub could be heard in both axillæ, and the patient complained of great pain on taking a

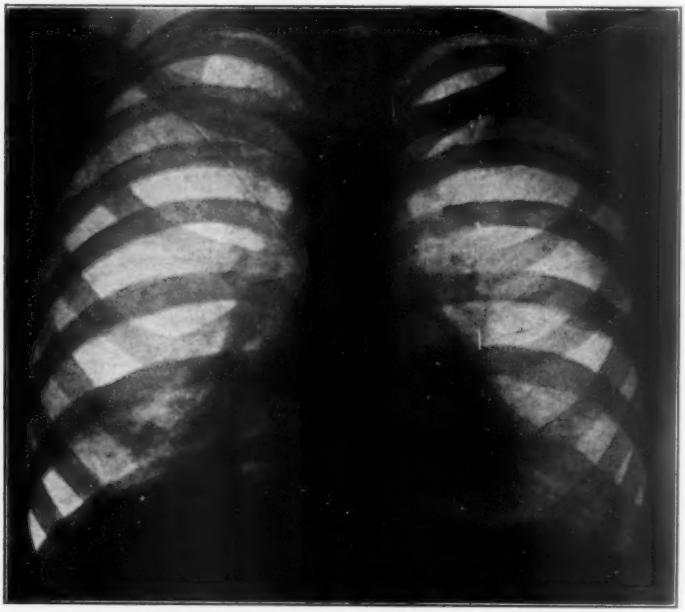

FIG. 2.—Roentgen-ray plate of Case II, taken before treatment. There is an area of increased density in the cardiohepatic angle consisting of coarse masses along the descending trunks of the right bronchus.

deep breath, worse on the right; no effusion. She expectorated much thick mucopurulent sputum streaked with blood. Repeated examinations failed to reveal tubercle bacilli. Her roentgen-ray plate is shown in Fig. 2. Her Wassermann was positive one plus. Otherwise the physical examination was negative.

There was nothing here to suggest pulmonary lues, but two points were suspicious: (1) The absence of tubercle bacilli in a sputum that looked as though it would be loaded with them. (2) The curious inconsistency between the severity of her symptoms and signs and

her healthy physical appearance, and perhaps also the history of blindness cured by an intramuscular injection. She was given potassium iodide at once and an intragluteal injection of mercury benzoate. Three days later she was decidedly better; temperature had fallen from 103° to 100° and the pulse from 130 to 92. She coughed less and had no more violent spasms of coughing; her dyspnea had diminished. Two weeks later her temperature was normal, and pulse 80. She was still coughing and her night-sweats continued, but were less severe. We began then very carefully

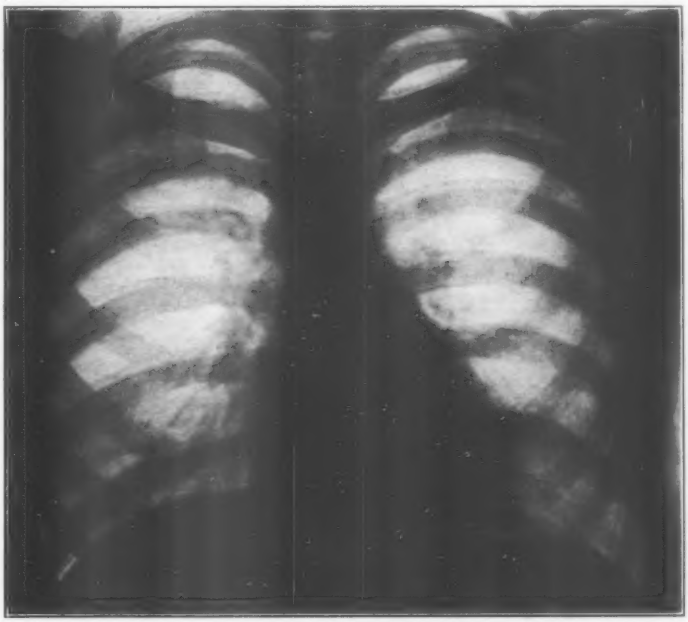

FIG. 3.—Same patient as Fig. 2, taken during treatment. Marked clearing of right base in cardiohepatic angle, with reappearance of the normal bronchial markings.

with old salvarsan intravenously, the first dose being 0.1 gram, the second 0.2 gram, the third and fourth 0.3 gram. In addition she received four mercury benzoate and four mercury salicylate injections and potassium iodide continuously.

December 16, 1915, one month after ceasing treatment, the temperature and pulse were normal; no dyspnea; no sputum; no more night-sweats; no more cough; no more pains in her chest; had worked part of the time in the moving-picture business, which required her to be in swimming frequently. Examination of her lungs at this time shows no wasting of intercostals or shoulder

muscles; no spasm or tension anywhere; diminished resonance above the second rib in front on both sides; slight dulness above on the right. Breath sounds slightly harsh over the hilus on each side, a little worse on the left; no rales. Expansion in general is a little slow; filling slightly labored; the breathing of diminished elasticity. A series of three roentgen-ray plates taken before, during, and after treatment are shown in Figs. 2, 3 and 4, and show quite clearly the improvement that took place. She gained 15 pounds in weight, from 125 to 140 pounds, the highest she has ever weighed.

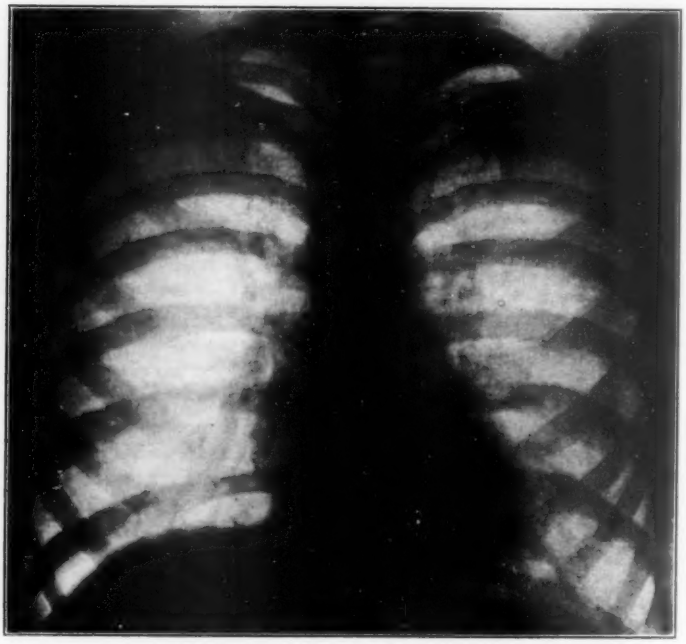

FIG. 4.—Same patient as Figs. 2 and 3 after treatment. Further clearing of right base; cardiohepatic angle well marked; bronchial markings in this area further reduced in size and density.

CASE III.—This patient, a young married woman, aged twenty-six years, was delivered at seven months of a premature baby at the University of California Hospital in January, 1915. The baby lived only a few hours. The Wassermann of the mother proved to be very strongly positive. She was accordingly referred to the medical clinic for antiluetic treatment.

She then gave the following history: Her primary lesion just inside the vulva occurred in December, 1913, followed by inguinal

adenitis, but no other signs of secondary invasion. She received at once twenty mercury injections from her private physician. Shortly after becoming pregnant her Wassermann was strongly positive, and she received from another physician one injection of old salvarsan and mercury pills and inunctions for one month, which antenatal therapy proved entirely inadequate.

On examination, February, 1915, the following points of interest were noted: cyanosis, dyspnea, precordial pulsation, presystolic thrill palpable over apex and base, culminating in a forcible shock corresponding to the first sound. Percussion and auscultation confirmed the diagnosis of a typical mitral stenosis. In addition there was a diastolic blow heard down the left side of the sternum, loudest at the pulmonic area. In the absence of peripheral signs (Corrigan pulse, high pressure, pistol-shot sound, etc.) it was finally decided that we were dealing with a Graham-Steele murmur, a relative pulmonary insufficiency. The heart was considerably enlarged to the left and right especially in the region of the left auricle and right ventricle. A history of acute tonsillitis as a child, complicated by chorea seemed sufficient cause for the cardiac picture.

Treatment was accordingly begun but was necessarily handicapped so far as the administration of salvarsan was concerned by reason of the cardiac complication. However, she received twelve mercury benzoate injections of mild dosage and small doses of potassium iodide over a period of four months, by no means satisfactory. In July, 1915, after having remained away for two months without treatment, she received 0.2 old salvarsan. A roentgen ray of her chest was taken at this time (Fig. 5) and revealed a mass roughly the shape and size of a large lemon, apparently in the lower lobe of the right lung. This was assumed to be a gumma. She returned to us in November after an absence of three months. She then admitted occasional night-sweats but no cough, and her dyspnea seemed well accounted for by her valvular disease. Another roentgenogram of the chest at this time disclosed precisely the same shadow in the same position and of the same size. Her Wassermann was then positive, one plus. From December, 1915 to April, 1916, she received twelve mercury salicylate injections and moderate doses of potassium iodide. During January and early February she coughed severely, especially at night, and suffered from drenching night-sweats. The antiluetic treatment did not influence this pulmonary affection, and finally inhalations and an ordinary cough mixture had to be utilized before recovery took place. By the end of February her cough and night-sweats had ceased. In April she had another attack of "bronchitis" (?). Sputum on both occasions was devoid of blood or Koch's bacilli. Finally, in May, 1916, another roentgenogram of the chest was taken, and again demonstrated an unchanged shadow in the right lung. This shadow has persisted therefore (known to us) for ten months, but it must be

confessed that, for various reasons, the therapy has been far from intensive and effectual. Her cardiac condition having improved considerably we are now attempting large doses of potassium iodide from 100 to 150 grains per day and salvarsan in an effort to dissolve this gumma, if such it be.

FIG. 5.—Roentgenogram of Case III before treatment (roentgen appearance unchanged after mild therapy). Circumscribed area of increased density at the right hilus, 3 by 6 cm., of uniform intensity, with sharply outlined margins; increased bronchial markings to the right base gumma. Note enlarged mitral heart.

CASE IV.—(Reported through the courtesy of Dr. Rene Bine). This patient, a man, aged forty-one years came to Dr. Bine's office, July 7, 1915.

His family history is not significant. He had been married eighteen years; reported his wife in good health; had one son, aged sixteen and one-half years; alive and well; no dead children and no miscarriages.

Past History. Fifteen years ago had a small tumor cut out of right cheek, leaving now but a small dimple as evidence. Before he married was treated for some swelling around eyes. Also had a small opening on right side of neck just above sternoclavicular joint and this discharged pus. After awhile this stopped, then his nose got stopped up. This nasal trouble has been present now five

or six years. Seven and one-half years ago had inflammatory rheumatism, was four weeks in bed. Malaria twenty years ago; no typhoid. He denied both lues and gonorrhea.

Habits. Does not use alcohol or tobacco. Appetite normal; sleep normal; bowels regular.

Present Illness. Has been feeling run down for about one year. Has lost about 7 pounds. Has a slight cough but no sputum.

Examination. Well developed, poorly nourished, very pale looking, lower lids puffy; conjunctiva pale. Pupils normal, no enlargement of epitrochlears. Moderately enlarged inguinals. Postcervicals not enlarged. There is an enlarged gland on right side just below jaw; there is also a fairly marked swelling just above the left sternoclavicular junction. From this at the lower end, right over the sternum there is a little sinus from which a little pus can be squeezed out. A probe introduced into this area goes upward and outward into the soft tissues, apparently the seat of the swelling, and does not come in contact with any bone. Opening of this sinus is just opposite a scar of the previously healed one.

Heart: negative. Lungs: marked dulness from apex to fourth rib on right side and corresponding dull area posterior, being down to midway between the angle and the spine of the scapula. Breath sounds are harsher over dull area and voice sounds definitely increased. Lower borders of lung move normal on both sides. No rales. Abdomen: fairly full, nothing abnormal detected. Knee-jerks present and lively. Palate: there is marked perforation in the anterior portion of the palate; it was so far forward that it was almost overlooked. Nose: there is considerable swelling in the cartilages, breathing is probably greatly obstructed; the swelling is more marked on the right side of the septum. Blood: hemoglobin, 70 per cent., 3,750,000 reds, 8200 whites; polymorphonuclears, 62 per cent.; mononuclears, 3 per cent.; lymphocytes, 32 per cent.; eosinophiles, 1 per cent.; basophiles, 1 per cent.; transitionals, 1 per cent. Urine: negative. Wassermann, three plus. Pus from sinus shows many staphylococci, many polynuclear leukocytes, but no acid-fast bacilli.

From July, 1915 to March, 1916, he received thirty-two mercury salicylate intramuscular injections and 0.45 gm. neosalvarsan intravenously. He improved rapidly, the cough disappearing very soon. April 28, 1916, his Wassermann was negative; the patient felt entirely well and had more than regained his weight; in fact, he looked like a different man. The dull area from the right apex to the fourth rib had not cleared entirely, but was somewhat modified, while the sinus of the neck had healed completely. In this case the diagnosis and consequent successful therapy was due in large degree to a somewhat peculiar intonation of the patient, which prompted Dr. Bine to recall the patient just as he was about to leave the office, with the important result of finding the perforation

of the palate which as noted was unusually far forward. This discovery at once established the diagnosis of syphilis and aroused the suspicion that the pulmonary lesion might likewise be of luetic origin. Unfortunately no roentgen rays of the lungs were taken.

CASE V.—Woman, aged twenty-seven years. She had been married thirteen years; has three boys living and well (not examined); one child died, aged eight and a half years, of "typho-pneumonia;" another child died, aged one and a half months, of intestinal obstruction; no spontaneous miscarriages.

March, 1915, a luetic condition of the septum and soft palate was diagnosed; Wassermann strongly positive, and she admitted a sore on her vulva twelve years before. She was given mercury inunctions and later "mixed" internally, and the above process yielded promptly to treatment. The following November she developed her pulmonary affection. She insists that she never had any respiratory complaints previous to this date. Her symptoms at this time consisted of coughing, mostly at night and in the morning, with copious expectoration of purulent sputum. In the morning she would cough up a small glassful of sputum. She thinks she had fever; no night-sweats. After a severe spasm of coughing, she had a small hemorrhage. She was then referred by her physician to the University of California Tuberculosis Clinic, and diagnosed pulmonary tuberculosis, until examined by Dr. Lewis S. Mace, who referred her promptly to me with the following report:

"Little in chest except possible dilatation of bronchi above the hilus on the right, also some loss of elasticity; no active lung inflammation; careful examination of the sputum is negative for tubercle bacilli." January 17, 1916, when she reported to the medical clinic, her Wassermann was positive, three plus. Roentgen ray of the chest (Fig. 6) showed no evidence of tuberculosis, but marked thickening at the roots with peribronchial infiltration.

Examination showed a somewhat undernourished woman, apparently not very ill; weight 110 pounds. In the left frontal region a depressed scar was found, the result of a mass that had been incised August, 1914, probably a gumma. Otherwise, with the exception of the lungs as noted above, the entire physical examination was negative.

From January 27, 1916 to August 22, 1916, she received twenty mercury salicylate, 20 per cent., intramuscular injections and small doses of potassium iodide and 0.2 gram old salvarsan. She was unable to pay for further salvarsan therapy. Her cough cleared up rapidly, but she continued to expectorate two or three times a day a semipurulent sputum. This was repeatedly found negative for tubercle bacilli. By June 5, 1916, coughing had ceased entirely, and there was no longer any expectoration. Another roentgenogram was taken at this time, but is not reproduced because it shows precisely the same condition as before treatment, yet clinically the

patient is entirely well, no longer coughs or expectorates, and has gained 16 pounds. August 19, 1916, Dr. Mace examined her lungs at my request in order to compare her condition with his findings of January, 1916 (before therapy was begun) and reports as follows: "She has made a remarkable recovery and is a very different-looking person from the one who came to the tuberculosis clinic December 31, 1915, and was diagnosed pulmonary tuberculosis. No cough and no expectoration for the past three months. Percussion resonant throughout. Right side vesicular throughout. Left shows sharp

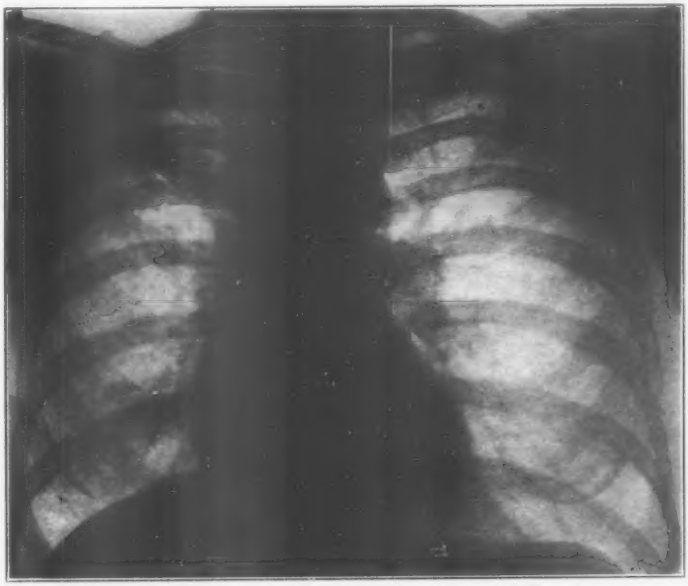

FIG. 6.—Roentgenogram of Case V (roentgen appearance the same before and after treatment). Dense mass of glands at the left hilus and generalized peribronchial thickening; slightly increased density at the right top.

breathing at the hilus, but no rales even on forced respiration or coughing. The above examination shows no abnormalities except slight rough inspiration at bases."

It is difficult to account for this improvement, under purely antisyphilitic treatment, unless the pulmonary condition be considered luetic. It is certainly not tuberculous.

CASE VI.—A Russian housewife, aged thirty-five years, entered the University of California Hospital, November 19, 1915 (service of Dr. Herbert Moffitt). At this time she suffered from a gumma of her upper lip, and a lesion the size of the palm of the hand, kidney-

shaped, with area of necrosis and exudation of pus, and raised infiltrated edges and raw ham-colored periphery covering the lower end of the sternum. The soft palate was scarred and distorted from former lesions; the uvula practically gone, its remains scarred and drawn posteriorly. In short, she showed the characteristic late tertiary skin lesions of syphilis. The spleen was very large, hard, and firm, with rounded edge. The sharp edge of the liver could be easily felt and the right lobe extended to the iliac crest, with sharp, notched edge, but smooth surface. Fingers of both hands were clubbed and roentgen ray of left tibia and fibula showed periostitis. The patient had lost 70 pounds during the previous four years. Both Wassermann and luetin tests were strongly positive.

She remained in the hospital twenty days and received during this time three intragluteal injections of mercury salicylate and 1.1 gram old salvarsan in two doses; also potassium iodide. At the date of discharge all external lesions had healed, and the liver had diminished markedly in size.

It is to be noted that her lungs at this time were resonant throughout, bases moved freely, breathing was normal, and there was no fluid in the pleural cavities.

The patient left the hospital December 8, 1915, with instructions to report to the out-patient department for further antiluetic treatment, but she felt too ill and weak to do so. She reëntered the hospital March 22, 1916, and during the three months' interval had lost 20 pounds more. She insisted that she took potassium iodide regularly during this time. Soon after leaving the hospital in December she noticed that her abdomen was swelling, which had gradually progressed. She had frequent attacks of abdominal pain, and was confined to her bed most of the time. She thought she had fever every morning; often was chilly, followed by sweats; occasional cough; no sputum. Wassermann was still positive three plus.

In addition to the smoothly healed lesions, treated during her previous entry, the following remarkable points were noted.

Chest: very thin, retracted spaces; prominent ribs. Left base moved much less than right. Intercostal spaces sucked in with respiration, especially at left base in front and in axilla. Respirations slightly increased in frequency and breathing harsh. There was consolidation of the lower lobe and the base of the upper lobe on the left, with fluid at the base. Bronchial breathing heard over all of this area with bronchophony extending high in the left axilla; crepitant and crackling rales heard above with moist rales at base on left. Few scattered crackles throughout both lungs, with harsh breathing. Shifting dulness elicited in front at the level of the fourth and fifth ribs on the left. Heart evidently pushed over to the right.

The abdomen was even more astonishing. It was rounded, bulging, fairly tense, and much increased over former entry. No shifting dulness or fluid wave could be elicited. The spleen was enlarged, much as before, with firm, round edge. The liver seemed to be much smaller than before treatment, but was difficult to feel. In the left flank a firm, tense, somewhat elongated mass, slightly movable, but apparently deeply fixed, was felt. This mass of enormous size was not present four months before. Since we are primarily interested in the pulmonary affection, suffice it to note that when she left the hospital, two months later, after intensive antiluetic therapy, this great tumor was practically gone, barely noticeable in comparison to its former size.

Two days after admission an exploratory puncture of the left thorax resulted in the withdrawal of 30 c.c. of a bloody fluid; upon centrifugalizing the fluid red cells settled out and a dark straw-colored fluid resulted in which a slight coagulum formed on standing; Rivalta, negative. Cells: great many red cells, with considerable cremation. Polymorphonuclears, 53 per cent.; lymphocytes, 26 per cent.; endothelial or tissue cells, 21 per cent.; apparently considerable degeneration of cells.

Four days later thoracentesis was performed, the needle being inserted in the ninth space on the left side in line with the angle of the scapula and also in the eighth space in the left posterior axillary line; 200 c.c. of red bloody fluid was withdrawn. With deep breathing the lung descended against the needle above and with respiration a resistance inside needle toward the spine was felt. Signs remained about the same after tapping. Rivalta negative and cells as described above. The following day a roentgen ray of the chest was taken (face up), and as seen in Fig. 7 a shadow involving the entire left chest, especially dense at the base, is noted; heart displaced to the right. She was then given 0.6 salvarsan intravenously and placed on mercury inunctions and potassium iodide. April 1, three days later, the mass in the left lower abdomen was noticably smaller, but the lung signs remained much the same. Her temperature had been normal and remained so throughout her two months' stay in the hospital.

April 6, it was noted that her back at the lower left base was board-like in consistency; that the whole left chest in the back was larger than the right, and that an area of bronchial breathing could be heard below the angle of the right scapula.

April 14 a needle was inserted in the tenth interspace in the line with the angle of the scapula on the left side; 1000 c.c. of dark brown fluid with bloody tinge was withdrawn. Specific gravity, 1020; Rivalta, negative; albumin, 4 per cent. Many red cells; practically all other cells are small lymphocytes.

The following day 0.4 gram old salvarsan was given intravenously. April 23, eight days later, dulness was receding in front and the

FIG. 7.—Roentgenogram of Case VI, taken before treatment (viewed from behind). Left chest entirely obscured by a diffuse shadow suggesting fluid. Heart displaced to the right; high diaphragm on the right; slight thoracic scoliosis.

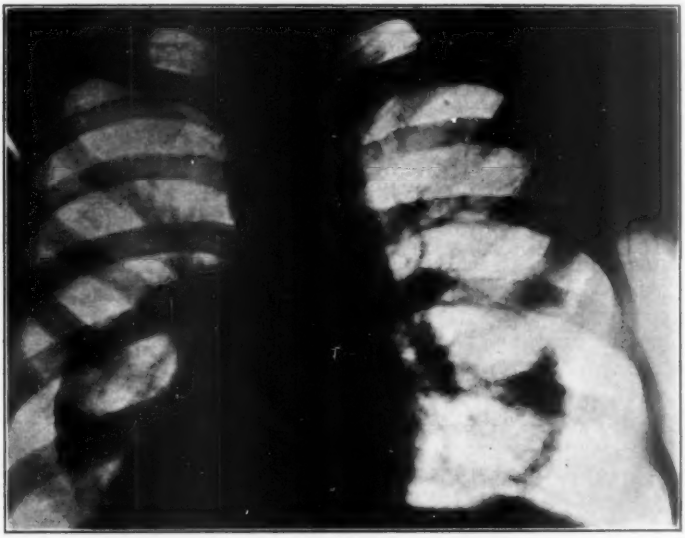

FIG. 8.—Roentgenogram of same patient as Fig. 7, taken after treatment. Left lung field entirely clear; heart in normal position; right diaphragm now normal.

tubular quality of breathing had practically disappeared. The left base behind was still bulging and filled out, as if from fluid.

April 28, 0.6 gram arsenobenzol was administered intravenously. The iodides had to be discontinued April 8 because of marked iodism. Mercury inunctions were given daily throughout her stay in the hospital.

By May 3 dulness at the left base was much reduced, with still some signs of fluid; no bronchial breathing. May 10 thoracentesis resulted in only 30 c.c. of fluid. The puncture was made not because there were any indications of much fluid but for diagnostic purposes.

A roentgenogram of the chest was taken immediately, and as seen in Fig. 8 the left lung had cleared remarkably; no indication of fluid; considerable peribronchial thickening in both lungs, with large shadows, probably glands at the hilus. The patient received 0.4 gram arsenobenzol May 20 and left the hospital May 27. At this time Dr. Whitney made the following note: "The lungs seem entirely clear, but there is a little dulness at the left base, probably thickened pleura. This has been a very remarkable case. It seemed hardly possible that the enormous mass in the belly and the practically solid lung could be syphilitic. The preliminary diagnosis was sarcoma. The remarkable clearing on mercury and salvarsan seems to certify the syphilitic nature of the lesions."

The patient never coughed during the stay in the hospital, nor was there at any time any sputum to examine. Repeated blood examinations showed a marked secondary anemia: hemoglobin (Dare), from 30 to 45 per cent.; red cells, 2,400,000 to 3,136,000. The white cells varied from 4600 to 9100. The polymorphonuclears from 74 to 85 per cent.; platelets 152,000 to 192,000.

Case VII. No. 25262.—A German, unmarried, aged thirty-six years, came to the medical clinic of the University of California Hospital July 27, 1916, complaining of cough. His family history and past history are of no significance. He denied venereal disease and no history of secondaries could be elicited.

His illness, which consisted purely of coughing with copious mucopurulent expectoration, dated from a month and a half previous. He had no fever, night-sweats, chest pains, or hemoptysis. He had lost 25 pounds during this time, weighing 155 pounds August 1, 1916.

Examination showed a strongly built, moderately nourished man, looking somewhat older than stated age. Pharynx disclosed a number of grayish ulcers, with slightly raised borders, surrounded by a reddened areola. There was general glandular enlargement; cervical, axillary, epitrochlear, and inguinal. There were squeaky inspiratory and expiratory rales over both sides, with possibly diminished resonance over both apices behind, but without further signs. Otherwise the routine physical examination was quite negative.

Roentgenogram of the chest (Fig. 9) showed what was at first interpreted as an "old central TB."

Sputum was examined on several occasions without finding any bacilli of Koch.

Wassermann in blood serum positive two plus, denoting a definitely positive test.

Antisyphilitic treatment was begun at once, consisting of weekly injections of 20 per cent. mercury salicylate, potassium iodide, gr. 25 t. i. d., and intravenously arsenobenzol. One week after the first mercury salicylate injection he had gained 7 pounds and the cough had almost disappeared, sputum less, and only an occasional rale discoverable. In the first two weeks of treatment before giving arsenobenzol he gained 18 pounds, felt "new altogether," and

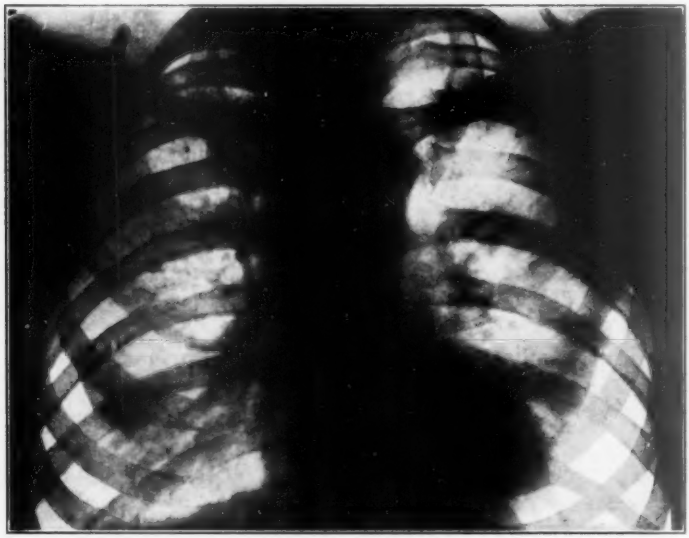

FIG. 9.—Roentgenogram of Case VII (roentgen appearance same before and after treatment). Diffuse peribronchial thickening. Note lengthened aorta.

certainly looked like a different man. From August 1 to October 25 he received ten mercury salicylate injections, potassium iodide, and three full doses of arsenobenzol. His weight was 155 pounds August 1; it was 190 pounds October 27, a gain of 35 pounds. His cough has disappeared, and consequently his sputum; and his chest is clear. Yet, another roentgenogram of his chest, taken October 13, shows no change from the picture seen in Fig. 9.

This case resembles Case V in several particulars. Both were considered tuberculous; both had negative sputa; both had positive Wassermann; both made remarkable clinical recoveries under antisyphilitic treatment, in the disappearance of both signs and symp-

toms; both show a roentgen-ray picture after treatment, indistinguishable from the picture taken before treatment. Are the shadows on the plates, scar tissue, the result of healing a syphilitic lesion? When a luetic ulcer of the skin is cured a scar remains. It is the scar-tissue contraction of a healed syphilitic stomach which often requires operative interference to restore function completely. Possibly this is the explanation for the persistence of roentgen-ray shadows after the symptoms have vanished, of which they were supposed to be the cause. If such be the correct interpretation it would be unreasonable to expect a perfectly clear plate after treatment.

CONCLUSIONS. 1. Syphilis of the lung is uncommon, but not extremely rare.

2. It is worth diagnosing correctly.

3. It does not produce a typical clinical picture, easy of diagnosis.

4. It should be kept in mind and ruled out in every case thought to be pulmonary tuberculosis where the sputum is negative for tubercle bacilli.

5. Proper antisyphilitic treatment produces remarkable cures.

6. Dr. Barker's advice is helpful (if you have a reliable serologist): "When in doubt, have a Wassermann test made; when not in doubt, still have a Wassermann test made."

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THREE CASES OF INFECTION OF THE UPPER RESPIRATORY TRACT WITH STAPHYLOCOCCUS PYOGENES AUREUS, PRESENTING THE SYMPTOM-COMPLEX OF ACIDOSIS.

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During the winter of 1915 and 1916 in Boston and its vicinity the usual epidemic of "colds" was of such uncommon severity as to provoke considerable discussion in the lay and medical press. Although several small groups of cases have been reported, no comprehensive epidemiological study has been published. From the meager reports obtainable it is possible to divide these cases into two classes:

1. Uncommonly severe and frequent nasopharyngeal infections in adults, which in some few instances have been proved to be of influenza bacillus origin.

2. Infections in children, in whom gastro-intestinal symptoms have been so prominent as to divert attention entirely from the respiratory tract.

The general feeling has been that these infantile cases must in some way have been related to the adult type, and in consequence such a diagnosis as intestinal influenza has often been made; but not a single case reported has been substantiated by culture.

It is the group of infections in children with which this paper will deal. These are the cases in which the symptom-complex known as acidosis occurs and which have provoked so much discussion. Morse, in a recent article, has most ably reviewed the subject. He says in reference to the Boston epidemic: "It is my opinion that in the vast majority of instances the diagnosis of

acidosis had no reasonable justification. An epidemic of acidosis is impossible because of the etiology of the condition, and what has appeared to be an epidemic may be explained by the fact that a number of cases of secondary acid intoxication have happened to occur in the course of an epidemic of some other disease such as tonsillitis, la grippe, or nasopharyngeal infections." Holt states that 30 per cent. of 200 consecutive cases in the New York Babies' Hospital showed acetonuria, and of all babies with pneumonia, 70 per cent. have acetone and diacetic acid in the urine. It is evident that so much attention has been paid to this peculiar group of symptoms that often no attempt has been made to determine the primary cause.

During the winter months there came to autopsy in this laboratory a small group of 3 cases which had shown the clinical picture of acidosis. All offered a common etiological factor and presented similar postmortem findings. Although the number of cases is too small to justify an attempt to draw from them any general conclusions regarding an epidemic of such proportions as the one just passed, yet this small series may prove of interest in connection with data which may be reported by others.

CASE I.—W. T., aged seven years. Complaint: difficult breathing; sore throat.

Present Illness. Sudden onset at midnight after feeling well previously; complained of sore throat, headache, and difficult breathing; became feverish and vomited. Sent by family physician to hospital, with a diagnosis of laryngeal diphtheria. Diagnosis by admitting physician: pneumonia.

Physical Examination. On admission the temperature was 103°. Pulse, 160. Respirations, 60. Patient dyspneic, cyanotic, and moribund. Heart sounds rapid and of poor quality; pulse small. Lungs: massive consolidation of right lower lobe, bronchial breathing, and coarse, moist rales throughout both lungs. Did not respond to stimulation, and died thirteen hours after onset.

Autopsy (15–144) one hour and ten minutes postmortem.

Body is that of a large, well-developed, well-nourished white male child.

Larynx and Trachea. These organs present on their mucosal surfaces considerable thick, viscid gray, purulent material. Microscopically the epithelium has disappeared and there is considerable superficial necrosis of the underlying tissues. Large masses of fibrin and a few pus cells have collected. In the surface necrotic material, in the folds of the mucosa and in the underlying tissue, are large masses of cocci.

Pleural Cavities. Left, negative; right contains approximately 300 c.c. of clear straw-colored fluid in which are small detached masses of fibrin. The visceral and parietal surfaces are covered with fresh fibrinopurulent exudate.

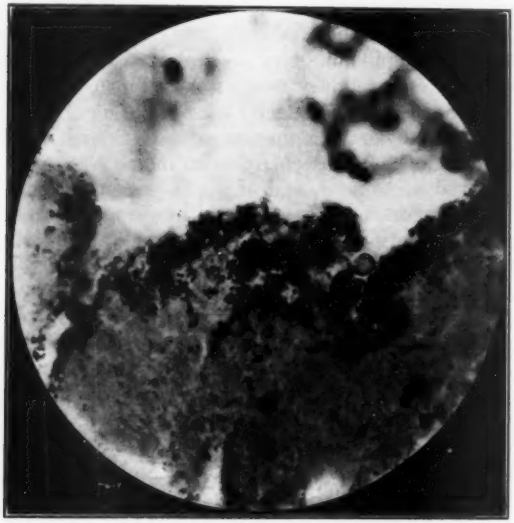

FIG. 1.—Tracheitis (15-141). Masses of cocci on surface; lining epithelium has undergone necrosis and disappeared; no membrane on surface; necrosis of underlying tissues below, which is an inflammatory exudate of polymorphonuclear leukocytes. × 200. Gram-Weigert stain.

FIG. 2.—Portion of field in Fig. 1. × 1000.

Lungs. Left, negative; right, the upper lobe and upper half of the middle lobe appears normal. The remainder of the lung is deep red in color, firm in consistence, and crepitation is entirely absent. This portion sinks in water. Section reveals a pale, purple-red surface with dark red mottling. On slight pressure considerable gray-green purulent material exudes from the bronchioles. Mucosal surface of bronchi covered with a similar material. Vessels appear normal.

The microscopic examination of the involved portion of the lung presents the following picture: Normal outlines are obscured by hemorrhage, which has distended and ruptured the alveolar walls. Its source is evident on examination of the vessels. Their lining endothelium is raised in places by accumulations of fibrin and endothelial leukocytes. Other vessels show an asymmetrical thickening of the intima which a scharlach R preparation demonstrates as due to an accumulation of fat in the intima. This injury in places is so severe that rupture has resulted. Occasional small deposits of fibrin occur immediately about the vessels. Lying in the large areas of blood-filled alveoli are great masses of cocci. The amount of purulent exudate is small. The bronchioles have also been invaded by hemorrhage; some contain small collections of leukocytes. The lung tissue immediately surrounding that involved by hemorrhage is edematous and is infiltrated with numerous polymorphonuclear leukocytes.

Spleen. Weight, 120 grams. The capsule is smooth and of a deep red color. Section reveals a firm, plane surface, dark red in color, on which the Malpighian corpuscles are readily visible as yellowish points. Trabeculæ not prominent. Microscopically the vessels and sinuses are seen to be injected. The vessel walls present an asymmetrical, hyaline thickening, with partial occlusion of the lumen. Scharlach R demonstrates the presence of fat deposits in the intima just beneath the lining endothelium. The germinal centers are filled with fatty endothelial cells, which are incorporating and digesting lymphocytes. Some of these endothelial cells are in mitosis. No fat is present in unphagocyted lymphocytes nor in endothelial leukocytes not engaged in phagocytosis, nor is it present in endothelial leukocytes which have taken up blood pigment. Small fat droplets occur in polymorphonuclear leukocytes scattered throughout the pulp.

Kidneys. Combined weight 170 grams. Organs not remarkable in gross. Microscopically the only lesion demonstrable is an extensive deposit of fat in fine and coarse droplets in the epithelium of the convoluted tubules and in the loops of Henle.

Adrenals. Appear normal in gross. Microscopically the cells of the glomerulosa show a vacuolization of their cytoplasm due to increased lipoid content. The nuclei are pyknotic. No leukocytic reaction is present. The fat cells in the tissue about the organ are of embryonic type.

Lymph Nodes (mesenteric and cervical). Enlarged, firm in consistence, and of a dark red color. On section they present a homogeneous pink-red surface. Microscopically they show marked endothelial hyperplasia and phagocytosis similar to that in the spleen.

Gastro-intestinal Tract. Stomach and jejunum not remarkable. Throughout the ileum the Peyer's patches and solitary follicles are markedly swollen and of a dull red color. The lymphoid tissue of the colon is likewise hyperplastic. Microscopically the intestinal lymphoid tissue resembles that of the rest of the body.

Aorta. Shows microscopically rather extensive fat deposits in the intima just beneath the endothelium.

Thymus. Weight 30 grams. Extends well over the anterior surface of the pericardium; appears normal.

Blood in all the organs shows a large amount of free fat demonstrable by scharlach R as globules lying free in the serum.

Heart, Pancreas, Liver, and Genito-urinary Organs. Negative. Cultures from the heart's blood, bronchial pus, and laryngeal exudate show Staphylococcus pyogenes aureus in pure state.

Diagnoses. Acute laryngitis and tracheitis; Staphylococcus aureus septicemia; lobular pneumonia with intense hemorrhage; toxic reactions in the lymphoid tissue of the body, in the arterial walls, in the renal epithelium, and in the glomerulosa of the adrenal; lipemia; embryonic type of cell in the body fat.

CASE II.—M. O'N., age less than one year.

A small, poorly-nourished white female child admitted to the contagious wards with aphonia, a croupy cough, stridor, and a slight serous discharge from both nares. Tonsils slightly enlarged, no membrane; slight posterior nasal discharge. Few small posterior cervical glands.

Laryngoscopy. Redness and congestion of rim; thin gray membrane covers entire larynx above cords and extends over rim anteriorly. Small piece of detached membrane hanging from right arytenoid. Patient intubed immediately and given 22,000 units of antitoxin. Temperature, 103°; pulse 150; respirations, 60.

On the third day after admission the temperature dropped to 99° and respiration to 42; pulse, 150. Patient suddenly became cyanotic, relaxed, and stopped breathing. Extubed and artificial respiration employed without success. Diagnosis: diphtheria. Cultures taken from nose and throat on admission negative for diphtheria bacillus.

Autopsy (15–147) eighteen hours postmortem.

The body is that of a well-developed, poorly-nourished white female child. The anatomical lesions are similar to those of Case I, including laryngitis, bronchopneumonia, and hyperplasia of the lymphoid tissues throughout the body. Microscopically the larynx shows a more extensive necrosis than Case I; the bronchopneumonia

is of the usual type and is unaccompanied by severe hemorrhage. The hyperplasia and phagocytosis with fatty changes in lymph nodules correspond exactly with the picture in Case I. The involvement of the renal epithelium and of the intima of the aorta are more severe, especially in the former location, where extensive fat deposits occur in all portions of the tubular epithelium. No changes in the adrenal are seen in this case. A lipemia of moderate degree is present, demonstrated as in Case I.

The bacteriological findings here cannot be given as much credence, as the cultures were taken eighteen hours postmortem. The absence of diphtheria bacilli in cultures taken at laryngoscopy is significant; no record was kept of the presence or absence of staphylococcus. Postmortem cultures showed Staphylococcus aureus in pure culture in the larynx and left lung, where it is also seen in sections. The right lung shows pneumococcus on culture.

CASE III.—M. Q., aged two years.

Family and Past History. Negative.

Present Illness. Six days ago nose began to discharge. Fever and cough; no convulsions or chills, vomited yesterday.

Physical Examination. Patient cyanosed; breathing rapidly; eyes glazed. Marked aphonia and stridor. Dulness over entire left back. Distant bronchial breathing. Many rales in both lungs. Laryngoscopic examination reveals marked swelling of the right arytenoid cartilage, redness, and swelling of the larynx and membrane on both cords. Smears show staphylococci.

Autopsy (16–33) eleven hours postmortem.

Body is that of a well-developed, well-nourished, white female child. The principal anatomical lesions are acute laryngitis, bronchopneumonia, acute exudative laryngitis, and general hyperplasia of lymphoid tissue.

Microscopically the reaction in the larynx is very extensive, comprising a phlegmonous inflammation of all structures down to and involving the perichondrium. The anatomical diagnoses of bronchopneumonic and acute exudative pleuritis are confirmed. The lymphoid reaction is similar to that in the previous cases. All portions of the renal epithelium show very extensive fat deposits.

Culture from the larynx obtained immediately after death through the laryngoscope showed staphylococcus in pure state. Further cultures at autopsy, eleven hours later, show a variety of organisms in the heart's blood and pneumococcus in the pleural cavity.

The striking features common to these cases may be briefly summarized as follows:

All are due to infection of the respiratory tract, with Staphylococcus pyogenes aureus. Case I shows in addition a septicemia.

All show an acute laryngitis, bronchopneumonia, and various toxic reactions appearing in lymphadenoid tissue, in the walls of

bloodvessels, in the renal epithelium, and in one instance in the adrenal cortex.

The severity of the lesions varies distinctly with the virulence of the infecting organisms, but in all the type of reaction is the same. Toxic reactions predominate to such an extent that in Case I, where a bacteremia is present, no abscesses occur in the viscera. Most unfortunately no urine analysis was made on any of the cases. From clinical evidence it is reasonable to suppose that acetonuria may have been present.

Bacteriology. The organism recovered from Case I has been most extensively studied and has been the strain employed in all experimental work. It was obtained in pure culture from the heart's blood, larynx, and lungs. No diphtheria bacilli could be found in smear or culture from the larynx. Culturally and morphologically this organism is a typical Staphylococcus pyogenes aureus. Its cultural characteristics may be briefly stated as follows:

On all ordinary media in twelve to eighteen hours there appear pale yellow discrete colonies which soon change to deep orange color and become confluent.

Litmus milk is coagulated, but no acid is produced in twenty-four hours; after forty-eight to seventy-two hours a very faint acidity is noted.

On Dunham's peptone indol is formed and nitrates are reduced. Gelatin is liquefied.

By Eijkman's method it was demonstrated that this strain of staphylococcus would produce a lipase *in vitro*, while two strains known to be non-pathogenic failed in this particular. His method in brief is as follows: A thin layer of sterile melted beef fat is poured in a Petri dish. This is allowed to harden and then a thin layer of agar at 42° C. is poured on its surface. Transplants are made in the usual manner on the surface of the agar. After twenty-four to seventy-two hours the fat underlying colonies of lipase-forming organisms becomes white, opaque, moist, brittle, and adherent to the underlying glass, due to the splitting of the fat and formation of fatty acids. Under colonies of organisms possessing no such power the fat remains unchanged.

On blood agar in twenty-four hours the colonies are surrounded by a zone of hemolysis. The following carbohydrates are fermented with the production of acid but no gas: dextrose, saccharose, mannite, raffinose, and maltose. No changes are produced in dextrin, salicin, and inulin.

Discussion of Lesions. *Laryngitis.* There have been occasional references in the literature to the production of true diphtheritic membrane in the larynx by Staphylococcus aureus. Neisser states that he has seen "isolated cases with dense diphtheritic membrane (of such origin) which in one instance extended into the bronchi; postmortem bacteriological findings were definitely

established, no diphtheria bacilli being found but only Staphylococcus aureus in pure culture." In the records of this laboratory extending over a period of twenty years, however, not one case could be found in which a laryngitis was excited by uncomplicated staphylococcus. It is possible that, owing to the importance of diphtheria bacilli in this location, observers have failed to report the presence of staphylococcus, regarding it as a contamination or secondary invader.

In this present series all 3 cases present the picture of a very strong toxin acting locally to produce extensive necrosis of tissue. In Case I the body is reacting most vigorously with cellular exudation and the formation of fibrin in the deeper tissues. In Case III the invading organism seems to have the upper hand and only marked necrosis with little or no cellular exudation or fibrin deposit is seen. It is conceivable that had the toxin been allowed to act over a longer period of time true membrane might have been formed.

Bronchopneumonia. In all 3 cases this process is apparently due to direct extension from the larynx. The pulmonary involvement is comparable in all the cases, although Case I is complicated by marked toxic vascular lesions and embolic abscesses, and in the second case an acute exudative pleuritis accompanies the process.

Occasional reference to staphylococcus pneumonia is made in the literature, but its frequency appears to vary. Soper reports a series of 40 cases of all ages showing positive staphylococcus blood cultures, 30 per cent. of which developed pneumonia. Weichselbaum in a small series of 5 cases of pneumonia finds 20 per cent. due to staphylococcus. Dürck among 41 cases of pneumonia in children finds 50 per cent. due to Staphylococcus aureus. Schottmüller has recently reported a series of 4 cases of infection of the respiratory tract, which is almost parallel to those above described. His cases all occurred in young and healthy infants, with sudden onset, marked dyspnea, and cyanosis. All progressed to pneumonia and later empyema. Only 1 recovered; 3 came to atuopsy. The latter showed uniform findings, namely: redness of the pharynx, exudate in the trachea, unilobular pneumonia, and empyema. In every case a pure culture of Staphylococcus aureus was recovered from all of the involved areas as well as from the heart's blood. No abscesses in remote viscera could be found. It is unfortunate that no histological examination of the trachea, lymph nodes, etc., was made, but it may be presumed that lesions were present.

The laboratory records of this institution show 860 cases of bronchopneumonia in individuals of all ages. Only 1.2 per cent. of this number are due to Staphylococcus aureus and less than 0.5 per cent. of the total number occur in children under the age of ten. In no instance has a sufficiently large number of cases been reported to allow of definite conclusions as to its frequency, and, moreover, it is likely that a staphylococcus is often disregarded as being a secondary invader.

Toxic Reactions. These lesions present the most interesting points for discussion and suggest many problems for experimental study. In general they resemble those encountered in the acute exanthemata, *e. g.*, diphtheria, scarlet fever, measles, and pertussis. In all of these conditions the respiratory tract is involved early in the course of the disease. In most of them the infecting organism remains localized and the changes throughout the body are due to the absorption and distribution of the toxin through the blood or lymph streams. The abundant lymphatic supply of the larynx seems especially favorable for such toxic dissemination.

The reaction in lymphoid tissue consists in active phagocytosis of lymphocytes by the endothelial cells lining the reticulum of the lymph nodules and a corresponding activity of the lymphoblasts (evidenced by frequent mitoses) to supply the deficiency of lymphocytes. The digestion of lymphocytes within endothelial cells is accompanied by considerable fat production, so that on examination of a scharlach R preparation of the spleen, for example, the centers of the nodules appear at first glance to be a mass of fat. That the formation of fat results only from destruction of lymphocytes is apparent from the fact that neither the inactive endothelial cells nor the unphagocyted lymphocytes contain fat. Mallory interprets the reaction as a utilization of the lymphocytes for food by the endothelial cells which are producing antitoxins. As a possible alternative he states that lymphocytes injured by toxin may be taken up to be destroyed by endothelial cells.

This reaction in lymphoid tissue is constantly excited by the staphylococcus toxin. It has been noted in every instance of staphylococcus septicemia in the laboratory records, twenty-four in number. In addition to the above-mentioned exanthemata it is also common in the septicemias of children and adults due to pneumococcus and streptococcus and in epidemic cerebrospinal meningitis. Local reactions occur in the mesenteric lymph nodes during peritonitis and in the mediastinal and bronchial groups in pneumonias.

Injury to vessel walls apparently results from the direct action of the circulating toxin on the intima. This injury to the cells causes the production of varying amounts of fat which is taken up by phagocytic endothelial leukocytes. In the repair process more or less fibrin may collect beneath the endothelium. Such reactions are found in the aorta and in the smaller arteries of the spleen and lung. In the latter locations the injury has been so severe as to result in hemorrhage. In the spleen especially, large amounts of fat have collected in the intima to produce an asymmetrical thickening. Although such vascular reactions may result from the action of many bacterial toxins, that of the staphylococcus would seem to be especially active in producing these lesions. It is of interest to note in this connection that small, repeated intravenous

injections of staphylococcus have been used by Starkadowski, Saltykow and others in the production of experimental arteriosclerosis.

The lesions of the kidney are also of interest. All cases show fat deposits in various portions of the tubular epithelium, but there is neither apparent uniformity of distribution nor direct relation to the strength of the toxin. Similar changes occur in other acute infections, but examination of numerous kidneys from children dying from causes other than infectious fails to reveal any fat.

One instance of a disturbance in the normal lipoid content of the cells of the glomerulosa of the adrenal occurs in this series.

The fat content of the circulating blood as seen in scharlach R stained sections is everywhere apparently increased, but no chemical determinations on the blood itself have been made.

These various metabolic disturbances, indicated by an increase of fat in the blood serum, by extensive pathological deposits in various organs, and by disturbances in the large deposits of fat tissues occurring throughout the body, opens an interesting field of speculation as to the origin of the acetone bodies in the urine. It has been demonstrated that the organism here studied produces a lipase on Eijkman's medium, and evidence of lipolytic action is everywhere present in the tissues. Although the presence of acetone bodies in the urine was not demonstrated in a single instance, yet it is reasonable to suppose that they were formed, as Hammarsten states: "At the present time the tendency is more and more to the view that the acetone bodies do not originate from the proteins but from the fats; if they are not the only source they are at least the most important." And to quote Howell: "Perhaps the most significant fact known bearing on this point (the oxidation of long carbon chain fats) is that under conditions which involve a large destruction of the fat in the body, as starvation, fevers, and especially diabetes, B. oxybutyric acid, together with aceto-acetic acid and acetone, is excreted in the urine." May not the action of this lipase in setting free fats in the circulation be a possible explanation for the presence of acetone bodies in the urine? Is not the frequency of acidosis in these children due to toxemias of various bacterial origins rather than to the fever, which is itself merely a symptom of intoxication? These and other questions present themselves, but they must be answered by the biological chemist.

Animal Inoculation. The reaction in the human body to this particular strain of staphylococcus was so manifestly toxic in character that an attempt has been made to reproduce these lesions in animals. The results have not been especially striking in that no single animal would present all the features common to the human cases, but, nevertheless, all the essential features have been reproduced in different animals.

A few preliminary inoculations with the freshly isolated organism

were made on guinea-pigs. These animals promptly died after twelve to twenty-four hours, without demonstrable lesion except in the case of intraperitoneal inoculation which showed considerable blood-tinged fluid.

Four months later this study was continued and a series of twenty-two young rabbits were inoculated in various ways. A small series of four animals was used to increase the virulence of the organism. Transfers were made from the subcutaneous tissue of one animal to another in rapid succession. The first animal lived four days, the second seven days, and the last two less than twenty-four hours. At the site of inoculation they showed an extreme degree of hemorrhagic edema. Toxic reactions in lymphadenoid tissue, renal epithelium, and the myocardium were parallel to those in the human cases and showed a quantitative increase proportional to the virulence of the organism.

Simple intravenous inoculation, although it killed two animals in twenty-four hours, produced no toxic reaction. Early abscesses developed in the heart and kidneys of both rabbits.

When intravenous inoculation was combined with pulmonary irritation (inhalation of ammonia or formic acid) three animals died in twelve to twenty-four hours, with marked edema and congestion of the lungs, and in one instance an early subpleural abscess. The lymphadenoid tissue in all these cases presented more or less toxic reaction. Fatty change in the renal epithelium and cardiac muscle was variable, being marked in two instances and absent in the other two.

In three animals intravenous inoculation and pulmonary irritation were combined with the action on the vagus of chloral hydrate given per rectum in dosage of 0.2 gram per kilo body weight. These animals developed no pulmonary lesions, but marked toxic reactions in lymphadenoid tissue occurred. The renal epithelium and cardiac muscle were involved to a moderate degree.

In two animals the left vagus was sectioned and ten minutes later a suspension of staphylococcus was injected through the cricothyroid membrane into the larynx. Both rabbits died in twenty-four hours, and at autopsy showed a purulent laryngitis; one had developed a lobar pneumonia involving both lobes on the side of the vagus section; the other showed an early pleurisy. Both presented more or less reaction in the lymphadenoid tissues, although not so marked as that following subcutaneous inoculation. The renal epithelium and myocardium had developed rather marked fatty changes.

In one instance deep intratracheal insufflation of a staphylococcus suspension was followed by a bronchitis which killed the animal in ten days. Mild toxic reaction occurred in the peribronchial lymph nodes.

An attempt was made to determine whether this organism produced a soluble toxin, for which purpose a modification of the

technic recommended by Neisser has been employed. The organism was grown for thirteen days at 37° C. on meat-sugar-free, 0.5 per cent. dextrose bouillon. At the end of this period the culture was centrifuged and the supernatant fluid was passed through a Berkefeld filter. Five per cent. of preservative composed of phenol 10, glycerin 20, and aq. dest. 20 was added.

The first rabbit of the series developed snuffles and was disregarded. The second animal received 7.75 c.c. of the filtrate in eight days. On the ninth day it was killed but no toxic lesions could be found. The third, which received a large dose (1 per cent. of body weight), died after fifteen days. The only demonstrable lesion was marked edema and congestion of the lungs.

Three animals were given intraperitoneal injections of this filtrate in doses of 6, 10 and 10 c.c. respectively. These died in from fifteen to forty-five days. Microscopically all presented focal collections of endothelial leukocytes in the liver. The spleens showed dilated sinuses in which the lining endothelial cells were actively phagocyting erythrocytes. The kidneys in every case presented toxic reaction evidenced in the presence of hyaline droplets in the epithelium of the convoluted tubules.

The results of these experiments are in many respects disappointing, for in no single instance was it possible to reproduce the whole picture seen in human cases. It would seem that the greatest absorption of toxin in the rabbit takes place from the subcutaneous tissues rather than from the larynx. Toxic disturbances of fat metabolism undoubtedly have been reproduced in this animal, but they are not nearly so marked as those in the human being. The accidental findings when filtrates were injected into the peritoneum are of interest, but in no way represent changes produced in the human body.

Summary and Conclusion. Uncomplicated Staphylococcus pyogenes aureus is capable of infecting the upper human respiratory tract with the production of severe local lesions.

In these 3 cases the reaction on the part of the body is not of the type usually associated with this organism, *i. e.*, simple exudation in the immediate presence of the bacteria, but it rather resembles the general reactions seen in the acute exanthemata.

Remote reactions of this type are constant in all of these cases, and comprise changes characteristic of a severe toxemia. They occur in the lymphoid tissue, in renal epithelium, in arterial walls, and in the fatty tissues. Each of these lesions is associated with the production or formation of fat, and a large amount of fat is present as globules free in the blood serum. In addition the presence of a lipase formed *in vitro* by this strain of organisms has been demonstrated.

Although it cannot be proved by morphological study alone, it seems plausible to suppose that some direct relation exists between these disturbances of fat metabolism and acetonuria.

Whether this peculiarity of reaction is due to some inherent quality of this particular strain of staphylococcus or whether it is a result of the anatomical distribution of the organism is uncertain. That the former explanation is correct may be inferred from animal experimentation. In the rabbit it has been possible to reproduce remote toxic reactions by means of inoculation in several different tissues, most notably the subcutaneous tissues and the lungs indirectly through the blood stream with the aid of a local irritant and depression of the vagus.

These cases also illustrate the necessity for examination of the larynx, an organ often neglected by pathologists in the course of routine autopsies. This is especially important in children showing hyperplastic lymph nodes.

I wish to express my thanks to Dr. S. B. Wolbach for his helpful criticism of this paper, and to Dr. F. B. Mallory for his valuable suggestions and also for the appended photomicrographs.

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URINARY INFECTIONS OF PREGNANCY AND THE PUERPERIUM.*

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The pregnant or parturient woman presents problems that bring her within the purview of every practitioner and specialist in medicine and surgery. She is a specially interesting and important

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patient, for upon the well-being of the mother depends also the safety of her coming or newborn child; hence two lives may be at stake whenever she becomes ill. And then, though pregnancy and the puerperium are physiological processes, they gravitate by such imperceptible degrees into the pathological, that to tell the normal from the abnormal is at times as difficult as to say when daylight ends and darkness begins. We are ever too apt to pass by complaints of the pregnant woman, regarding them only as inconveniences of her gravid state, until we are forced by explosive demonstration of symptoms to recognize the gravity of the situation.

It is with these considerations in mind that I present for your consideration the subject of infections of the upper urinary tract as a complication of pregnancy and the puerperium.

Neither pregnancy nor the puerperal state cause pyelitis nor any other of the urinary infections. On the other hand, both stand in the causal relation of predisposing to such infections. That is, the pregnant woman is only the more liable than the non-pregnant to such risks. Therefore we are at liberty to consider pyelitis in general, with only more particular reference to the aspects of the case introduced by the complication of actual or recent pregnancy.

The active or actual cause of urinary infections is the invasion of the urinary tract by pyogenic organisms. Nearly any organism may be responsible, but we have learned that one is much more frequent than the others. Every writer upon the subject lays stress upon the large percentage of colon bacillus infections. Of 23 patients of one series but 1 was produced by the streptococcus, and in all of the others the colon bacillus was the responsible agent.[1] When the infection, however, ascends from the bladder the streptococci and staphylococci are more apt to be present. A true gonococcus infection has scarcely ever been encountered in the higher portions of the urinary tract.

As just hinted, infections of the kidney and the pelvis of the kidney may arise through two channels: ascending from the bladder or through the lymph or blood channels. We must admit the possibility of infection of the higher urinary tract, ascending along the lumen of the ureter from the bladder; but experiment confirms the belief that lymph- or blood-borne infections are much more frequent.[2] And even in the not infrequent case in which the primary or secondary focus is the bladder the transmission of the infecting agent seems to be by way of the blood or lymph stream to the kidney rather than through the lumen of the ureter.

One of the interesting developments of modern medicine is the growing revelation of what we might call metastatic infections from remote and apparently innocuous foci. Urinary infection is no exception. In nearly every case some distant focus has antedated the urinary infection. In such connection, tonsillitis, otitis media, pyorrhea, cholecystitis, appendicitis, and salpingitis[2 3 4] have each

been indicted in the individual cases. But far above all other depots of supply for metastatic urinary infections is the intestine. The frequency of infection originating in the bowel accounts for the fact that the colon bacillus is oftenest the responsible organism. Infection of kidney from bowel without intermediate lesion has been a puzzling problem until recently Franke demonstrated an actual, direct connection through the lymphatics between the colon and the right kidney, which explains the preponderance of right pyelitis. These germs make their way from the cecum and colon through the posterior wall of the bowel and often also from the duodenum, without necessarily piercing the serous covering of the intestine. They pass readily to the lymph vessels in the kidneys and also into the ureters. The bacilli while in the bowel act usually as saprophytes, but when they are brought into contact with the urine they become pathogenic; while in the bowel they produce no antibodies; while in the urine they form spores.[5] As an interesting side-light on these colon bacillus infections from the bowel, "pediatrists have recently called attention to the comparative frequency of bacteriuria following extreme constipation, while the lower urinary passages remain persistently normal. Bumm has recently reported a significant case: intestinal trouble developed after excessive ingestion of milk and pyelitis followed, both promptly subsiding as the milk was discontinued.[4]

We must admit, too, that women, and especially pregnant women, are prone to these infections. The explanation of this susceptibility is not hard to find. Harttung[6] experimented by tying a ligature around a ureter in sixty-two rabbits. He found that the conditions thus induced invited suppurative changes in the kidney. When the infection was of ascending origin the kidney pelvis was involved first and predominantly, while with blood-borne infections the cortex suffered most. Couple this bit of experimental evidence with Weibel's[7] discovery that of one hundred normal pregnant women the ureters were more or less obstructed in 47 per cent., and predominantly on the right side, and we seem to have proved the problem. Ptoses, so common in women, and especially so in those who have been exposed to the drag of frequent child-bearing;[8] the pressure of the pregnant uterus upon adjacent organs, causing constipation and distention of the bowel with gas, so commonly observed in pregnancy; the dilatation and paresis of the pelvis of the kidney and ureter are favorable for the passage of the colon bacillus from the intestine; and the dilatation and paresis of the ureter and pelvis of the kidney assist in the infection of the urinary tract.[5]

In many cases pyelitis is present before pregnancy supervenes, and gestation but causes the process to become active.

"Acute infections of the kidney, primary in nature" (that is, so far as the urinary tract is concerned), "can be grouped anatomico-pathologically into three classes:

"1. The pyelitic group—infection of the pelvis of the kidney alone.

"2. The pyelonephritic group—infection of the pelvis plus infection of surrounding functioning portion.

"3. The cortical group—infection of the cortex or functioning portion only."[9]

Each of these groups give a distinct clinical and urinary picture, and to some extent the treatment is modified in each. From 60 to 80 per cent. will be included in the pyelitic group.[9]

The onset and course of this disease in its acute phases differ to a certain extent with the exact location or extent of the trouble, whether pyelitic or cortical especially. Within the recent past I have had opportunity to study 4 of them, 3 in pregnant women and 1 postpartum. The symptoms of the first 3 were singularly similar, and it will perhaps give a more practical turn to a discussion of the symptomatology if the case history of each of these be briefly abstracted:

1. White woman, aged twenty-nine years, complains of irregular chills for the past five days. She is six and a half months pregnant, the pregnancy so far being without complication. Since her first chill, five days ago, she has had two each day, followed by high fever, free sweating, and much aching. Aside from nausea she has had no other essential symptoms, no real pain except the general aching. She is seen just after a hard chill: pulse 163 and temperature 102°. She is apparently about seven months pregnant, the fetus in normal position. Marked tenderness is found in both flanks, especially over the left kidney posteriorly. The catheterized specimen of urine is loaded with pus. Leukocytes only 5200 per c.mm.

2. White woman, aged twenty-three years, complains of pain in the right abdomen of three and a half days' duration. She is seven and a half months pregnant for the first time. Three and a half days ago she began vomiting and soon after was taken with severe right-sided adominal pain, requiring two or three hypodermics to relieve her. Pain and vomiting have continued intermittently since. Temperature has ranged between 100° and 102°. Upon examination there is found much tenderness over the lower right abdomen, over the appendix. There is also tenderness in the right costovertebral angle over the kidney. The catheterized specimen of urine contains great numbers of pus cells. Leukocytes 14,600 per c.mm., with a polymorphonuclear count of 80 per cent.

3. White woman, aged twenty-two years, complains of pain in the right abdomen of five days' duration. She is between five and six months pregnant for the first time. Since being taken with a sudden right-sided abdominal pain five days ago she has continued to have more or less intermittent, colicky pain, with fever very high, a rapid pulse, and tenderness over the appendix. At examination pulse is 132, temperature 101°; slight tenderness can be made out over the right flank, but nowhere else at this time. An examina-

tion of the catheterized specimen, without centrifugalization or sedimentation, showed only six or eight pus cells to the field and rare red blood cells. But two or three days later another specimen was simply loaded with pus. Leukocytes 13,000; polymorphonuclears, 82 per cent.

Constructing the symptomatology then upon these cases and the recorded experience of others we might say that usually the woman has run the normal course of pregnancy until at some time during the second half she suddenly develops a chill, followed by high fever, sweating, then an intermission or remission of temperature. Or instead of a positive chill there may be only a sense of chilliness or of rigors, with fever marked by great irregularity. Sometimes pain is the more marked symptom, and with the pain vomiting and tenderness in the abdomen. The pulse is usually higher than the temperature would justify. As a rule, however, with the simple pyelitic group, the woman does not look as sick as one would expect.

Upon examination one expects to find on deep pressure over one or the other kidney some tenderness. One of our cases gave no tenderness anywhere, in spite of the fact that her urine contained quantities of pus.

The most interesting case of all perhaps was the one developing only after some weeks postpartum:

4. White woman, aged twenty-three years, complains of irregular fever and chills for the past eight days. Her first baby was born four and a half weeks ago, after a normal labor, being delivered by an obstetric specialist whose hands were protected by rubber gloves. Two days after delivery the patient was found running fever. Her physician made out what he considered was a valvular murmur and immediately suspected acute endocarditis, originating, he thinks, from thrombosis in a uterine sinus. From this time on she continued to run a little irregular fever, and developed an increasing degree of anemia, though she has been allowed to get up and about her room. Two weeks ago, the fever continuing and the other evidences of sepsis becoming more marked, a consultant advised puncture of the posterior cul-de-sac, suspecting pelvic pus. Another physician examined her pelvis at this time and could find nothing abnormal there. At this time her leukocytes were 14,000. Eight days ago the patient's temperature suddenly shot up much higher than it had ever been before, and then swung a distinct septic curve, between 99° and 104°, pulse 80 to 120. Her urine has been examined chemically only and pronounced negative. A third consultant has seen the patient, and, finding a murmur about the heart, has pronounced the case one of acute (septic) endocarditis.

At the time of this consultation she is just over a hard chill and shows some exhaustion. Pulse 140, temperature 103°. She looks quite anemic and weak. A bruit is made out, not over the heart, but at the second left interspace, and only when the patient is lying

down. It is not regarded as valvular at all by this consultant, but as a so-called "hemic murmur." Pelvis and abdomen seem absolutely negative. There is no special tenderness in the flanks. The catheterized, but non-centrifugalized, urine shows only three pus cells and an occasional red blood cell to each field. Her leukocytes are 11,400; the hemoglobin was 75 per cent.

This seemed to the other consultants in the case too small an amount of pus upon which to make a diagnosis, but with treatment directed to this condition alone the patient had only one slight chill subsequently and went on to perfect recovery.

The interesting point came out afterward that the patient throughout her later pregnancy had run a little irregular fever, which made her husband, a physician, fear tuberculosis. The probability is that she had had pyelitis all of this time, but the symptoms only became stormy after delivery.

So the laboratory may be of inestimable help in the diagnosis or it may give a very confusing negative report. As a rule, and as would be expected, there is more or less leukocytosis, with the polymorphonuclear elements predominating.

If one can only remember to think of examining the urine of all pregnant women, in the great majority there should be no trouble in recognizing urinary infection when it exists. Of course it is manifest that the specimen must be catheterized into a clean vessel. Even without the microscope one can be fairly certain of the condition from the gross appearance of the urine. If it be held against the light in a clean glass vessel, and it is seen to be turbid, and especially if ragged shreds of purulent appearance float around in the urine, the changes are strong that a urinary infection is present.

The microscope, of course, must be resorted to to make the diagnosis final. Too often the physician examines the urine for albumin, finds it present, and thinks of the case from that point on as one of nephritis, with the consequent purging and dieting which is not proper unless there be a certain element of nephritis complicating the infection. We need the microscope to differentiate between pus and casts as the cause of the albuminuria. Or, even more frequently, one will be surprised to find only a faint trace of albumin, with numbers of pus cells: if he is not in the habit of making microscopic urinalyses he will pass by such cases. With the pus there are usually numerous microörganisms, oftenest a motile bacillus, one of the bacillus coli group.

Of course there are many variations from this picture. One of our patients, with severe rigors and temperature of 104°, had only three pus cells to each field. It is easy to overlook such cases, most important of all, for in them the cortical portion of the kidney, its functioning part, is involved, and until the pus makes its way to the renal pelvis, where it can pass out through the ureter, we may not find a single cell, and the patient is all the sicker. The entire

kidney may be literally filled with minute abscesses, and yet not a single cell show in the urine. In another case there is a great deal more albumin, with far less pus, than in another with less albumin: in such cases we suspect a pyelonephritis and the microscope ought to show both pus and casts.

As one may easily guess, the diagnosis of these infections of pregnancy depends in large measure upon whether they are thought of as among the possibilities of the illness. "The important factor in its recognition is to remember that in the presence of the foregoing symptoms it is the most likely condition to be found as a complication of pregnancy."[2] The main "lead" in the greatest number is the toxemia. Toxemia, with high fever, chills, leukocytosis, and pus in an acid urine, with the presence of the colon bacillus in pure culture, should, of course, suggest the diagnosis. When pain is the prominent symptom the confusion that arises will depend upon how exactly it imitates some other pain. For instance, pleurisy may be suggested. The inflamed kidney moves painfully with breathing, suggesting at once a respiratory disease. In two reported cases pyelitis was actually accompanied by involvement of the pleura, the infection probably spreading through the lymphatics to the peritoneal and pleural sides of the diaphragm.[3] Pressure on the inflamed right ureter will often produce pain in the ileocecal region similar to that of appendicitis. It is peculiarly liable to be confused with appendicitis in those cases in which there is no change in the urine for the time being, or if the urinary changes are slight and transient, or if the ureter is blocked, so that only urine from the sound kidney is obtained by the catheter. Pyelitis may induce symptoms suggesting peritonitis: one case is reported in which laparotomy was done on the assumption of ileus from compression of the intestine by the gravid uterus.[3] Pyelitis may also simulate salpingitis, or puerperal infection. One case is mentioned in which the signs and symptoms suggested pneumonia, puerperal fever, appendicitis, and pyelitis all at once; but the diagnosis finally narrowed down to pyelitis alone.[3] In 2 cases profuse hematuria, for which the pyelitis was responsible, simulated uterine hemorrhages; it came on in 1 case like the hemorrhage of placenta previa.[3]

Practically, however, the greatest difficulty in the differential diagnosis is to distinguish these cases from acute appendicitis. We all recognize the fact that acute appendicitis is the most dangerous infectious complication to which a woman in late pregnancy is liable. To delay prompt operation may be fatal. We are aware of the fact, too, that some acute cases of appendicitis may show a little pus in the urine, and that a little pus may be all we expect in the acute renal case. No cut-and-dried differentiation will hold in every case. It has always struck me, however, that the chills, septic oscillations in the temperature, and the pain are more violent in the renal case than in the early appendicular one. One rarely requires

two or three hypodermics of morphin, for instance, to relieve the pain of early acute appendicitis; and seldom finds a chill with rise of temperature to 103°, with profuse sweating following, in the early days of an appendicular illness. These, coupled with pus cells in the urine, be they few or many, with the colon bacillus, and tenderness high up over the costovertebral angle, usually suffice to make the differentiation favor the renal source of infection.

The assumption that pyelitis of pregnancy does not require special treatment is wrong. I am sure that a number of mild cases never give urgent symptoms and are finally relieved after delivery more or less spontaneously. But when there are any real symptoms there is always danger for both mother and child. Opitz found that 40 per cent. came to premature delivery.[10] Another serious danger is the liability to breed puerperal infection. The woman comes up to labor, the placental site becomes infected through the blood stream, with consequent puerperal sepsis. As with eclampsia, there is reason to believe that there is more danger in pyelonephritis developing after delivery.[11] And they may be particularly hard to recognize. Murray,[12] for instance, reporting 8 cases commencing after labor, says that in 3 there was total absence of local signs and symptoms, temperature was remittent rather than intermittent, chills were absent, there were smaller amounts of pus in the urine, although the patients were seriously ill. The disease began on the day after delivery. He lost 1 out of the 8.

Like in many other conditions the ideal treatment of renal infections, whether combined with pregnancy or not, is impracticable for the general practitioner in the field in which he has to practice. It is not possible to gainsay the statement that the direct local treatment of the suppurative focus in the pelvis of the kidney and surrounding tissues through the cystoscope and ureteral catheter is the method of choice, theoretically speaking.[2 4 10 11 17] But fortunately we are not confined to this direct method of treatment, and have practical and for the most part efficacious modes of reaching the trouble, which can be carried out in the patient's home.

There is one rather mechanical mode of treatment that is probably not so often used as it deserves, that is, the distention of the bladder to its physiological capacity, the patient reclining with only the head above the plane of the bed. This reduces congestion in the renal pelvis, stimulates kidney secretion, modifies the urine, and thus combats the cause of retention and helps in the evacuation of the kidneys.[11] Posner[4] has encountered cases of pyelitis which dragged on for weeks or months and kept constantly recurring, and which healed promptly under daily rinsing out of the bladder with weak silver nitrate solutions in addition to the usual measures. He says that while the pyelitis may start from metastatic infection from the intestine, middle ear, or other infectious process it is kept alight by the secondary infection of the bladder and the muscular insuffi-

ciency on the part of the ureters. The stretching of the bladder in the local treatment may by reflex action arouse the kidney pelvis to contract and thus expel its contents better.

The drug treatment of urinary infections will be successful or the reverse in proportion to the rationality of the use of urinary antiseptics. Though in some degree foreign to the narrow title of this paper it may not be amiss to comment on the use and abuse of a certain drug which is thought of most prominently nowadays as soon as the word urinary antiseptic is mentioned. Hexamethylenamin is more often used indiscriminately and illogically than wisely. Any number of experimental and clinical observations could be cited, were it not a matter of common knowledge, that, to paraphrase Hinman,[13] hexamethylenamin, and all allied compounds, has absolutely no antiseptic value except as it is converted into formaldehyde, and except as the formaldehyde comes into contact with the infection. It is a further fact that formaldehyde cannot under ordinary circumstances be split off from hexamethylenamin unless the urine is acid. In fact, the percentage concentration of the formaldehyde in urine will depend upon the degree of acidity more than any other factor, which acidity should be greater than 2 c.c. of tenth-normal sodium hydroxide to 10 c.c. of urine. We know that we can increase the acidity of urine by feeding such drugs as the acid sodium phosphate,* but even under ideal conditions hexamethylenamin at the level of the kidneys has no antiseptic value, in the usual dose, perhaps because of the rapid passage of the urine through these structures.[15] Further still, while formaldehyde is present in the bladder when hexamethylenamin is given in the ordinary dose, it is usually too small a quantity for any antiseptic value, and is usually voided too quickly for the time factor necessary for its disinfecting qualities to assert themselves.

These conclusions probably account for many of our failures with this drug. My own experience is that urotropin has rarely been of service in the upper urinary infections, perhaps because of the impracticability of getting the urine acid enough to split off formaldehyde during the rapid transit through the kidneys and ureters.

But when the infecting agent is the colon bacillus, the one method of treatment which has given me most satisfaction is alkalinization of the urine, and the best drug for this purpose is potassium citrate. The plan is to give potassium citrate in sufficient dosage and with sufficient frequency to render the urine alkaline and to keep it so, day and night, for at least a week or ten days after all symptoms have disappeared. It will doubtless seem like an excess of

* Jordan[14] offers the practical suggestion that whenever acid sodium phosphate is prescribed—and it ought always to be prescribed whenever urotropin is—one should write the chemical formula (NaH_2PO_4) on the prescription, and to ascertain which phosphate has been dispensed. It is worth while, too, to occasionally test the urine to learn whether acidity is rising.

enthusiasm to say that one can confidently expect a rapid defervescence and a general improvement in all the other toxic manifestations within two or three days if this treatment is carried out intensively.

Yet one will be surprised at the dose of the citrate required to fulfil these conditions; 15 to 20 grains every two hours, and every three or four hours at night, will probably be the least that will accomplish it. A grievous disappointment is in store for one if the treatment be discontinued as soon as the symptoms abate.

As enthusiastic as I am about the effects of alkalinization as emergency therapy, as it were, I must confess that I have found the ideal, *i. e.*, the disappearance of pus from the urine, exceedingly difficult to attain under this simple treatment. This has been specially true when it complicates pregnancy. The mechanical difficulty of proper drainage is doubtless responsible. At any rate if the microscopic appearance of the urine be followed from day to day one will note a great diminution in the total number of pus cells coincident with the clearing up of the acute symptoms about the second or third day. But after a sudden drop in the number the pus persists, however actively the citrate treatment be pushed. Paradoxically, I have several times had the report that the patient seems perfectly well and is rebelling at continuing treatment, and found the urine still full of pus. The explanation of improvement, with the infection still persistent, is most difficult. At any rate we cannot afford to stop treatment merely because the patient feels well.

In this dilemma I have had recourse to the newer vaccines: the "sensitized," or serobacterins, the advantage of which is that carrying, as they do, their own antibodies the reaction is nothing like so probable nor so violent as with the older vaccines, and we can give ascending doses every day or every other day instead of at intervals of from three to seven days.

But while the stock vaccine has the advantages of being readily available and of offering its own antitoxins, practically, within its own substance, all stock vaccines are more or less of hit-or-miss prescriptions. This seems specially true of the colon bacillus. This organism alters its characters with its environment, and it is usually one of the many atypical varieties of the colon bacillus which causes these urinary infections. It is certain that the autogenous vaccines are much more efficacious.[16] As a rule improvement is rapid, and after the first dose the temperature may fall and the toxic symptoms be relieved, while the bacteria may disappear from the urine. But even so one must be guarded in giving a prognosis of rapid return to health or in discontinuing treatment too soon; for, though it may be easy to control the bacterial activity in some cases it is difficult and occasionally impossible to completely inhibit them. This treatment, too, should be controlled by periodical examinations of the urine.

Practically all reports are of the same tenor. Wulff,[1] for instance, reports after close study of 46 patients, 4 of whom were pregnant, and in all of whom the autogenous vaccines were used. The acute febrile attack was promptly arrested at one stroke and the tendency to recurrence cured. The rationale, as he explains, is similar to that of all vaccine therapy: the vaccine has put an end to the trouble either by destroying the primary focus or by modifying the system in some way, and in such a way that it is able to resist bacterial invasion. This latter seems to us the more likely because, as his experience indicates, that while 91 per cent of his cases were cured or materially improved under vaccine treatment the proportion of those who showed albuminuria was reduced only from 76 per cent. to 28 per cent.; of those who had pyuria, the reduction was from 100 to 41 per cent., but of those with bacteriuria the drop was from 100 only to 71 per cent. In other words, the infecting agents seem to be still present while the patient seems clinically perfectly well.

This conforms to common experience. Most of these pregnant women will continue to show pus in the urine, whatever the method of treatment, until they are confined, and yet under the vaccine treatment it seems to do them no harm, either during the further course of pregnancy, at labor, or during the puerperal period. The explanation is, probably, that the vaccine has conferred an immunity, though it is not able to overcome the mechanical obstacles to drainage, which are removed only by delivery.

To focus attention upon such points as may be of practical importance, one is justified probably in drawing the following conclusions:

1. Urinary infection as a complication of obstetrical practice is probably not rare. Just how frequent it is cannot be accurately stated. We have seen four cases during a period of time in which we have seen only one case of eclampsia.

2. Pregnant women are predisposed to urinary infection by reason of interference with drainage and by the further fact that conditions are ideal for transmission of infection.

3. The colon bacillus gaining entrance from the bowel is the usual infecting agent.

4. When a pregnant or puerperal woman has any febrile illness, whatever may be the type of fever, or whatever the associated symptoms, a catheterized specimen of urine should be obtained at the first visit. If this urine be cloudy, acid, and albuminous one should immediately suspect infection of the higher urinary tract and should make a microscopic examination before any other diagnosis is accepted.

5. Clinical signs and symptoms may be most confusing without, or even with, laboratory aid, and especially are we apt to miscall the case appendicitis, because the pain, tenderness, and rigidity are most often right-sided. In such case the right kidney region ought always to be examined for tenderness, etc.

6. Treatment which has been efficacious and at the same time practicable is (1) rapid alkalinization of the urine with potassium citrate. This has been more certain, by far, than hexamethylenamin. Certainly, potassium citrate and hexamethylenamin should not be given at the same time, for one tends to render the urine alkaline and the other depends upon a high degree of acidity for any possible value; (2) in the meantime we can usually get a supply of the "sensitized" vaccine, of the colon bacillus, because it can be sooner given than (3) an autogenous vaccine, which should be prepared as soon as possible. Under such treatment all of our cases so far have been controlled until delivery has cleared up the picture. But should the symptoms persist stormily in spite of us, then the patient should be referred for irrigation of the kidney pelvis, or possibly even nephrotomy or nephrectomy.

7. Mere persistence of pyuria, on the other hand, we might say is to be expected, and need occasion no undue alarm, if the patient be symptomless, and especially if there be no fever at all and no leukocytosis. Such patients usually go to full term, with normal labor and puerperium, immune apparently from risks of their infection.

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A SIMPLE PROCEDURE FOR PREPARATION OF COLLOIDAL GOLD FOR DIAGNOSTIC PURPOSES.

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The first attempts to prepare colloidal gold in St. Luke's laboratory were made according to the procedure recommended by Miller, Brush, Hammers, and Felton,[1] but in spite of the greatest care the solutions obtained were uniformly poor. Eventually it was decided to experiment independently with a view of getting some insight into the trouble which we and many of our predecessors had experienced, and ultimately a reliable and exceedingly simple technic was evolved for preparing colloidal gold which will satisfy every clinical requirement.

The glassware used was the Pyrex brand. It was cleaned, with no more attention than that usually given to laboratory apparatus, and was rinsed only with tap water. Indeed, it was noticeable that solutions with which it came in contact did not wet the surface but tended to form in drops. It is advisable, however, to avoid beakers that have had bad scratches, as reduction tends to take place there.

Ordinary distilled water was used; no attention was paid to the time that elapsed since distillation, and it was drawn from stock containers. In view of the impurities possibly contained in some of the reagents[2] and the known toleration of colloidal gold solutions for electrolytes,[3] it is felt that in an emergency tap water could be employed, and satisfactory solutions have been made with it. All the reagents were obtained from Merck & Co. The potassium carbonate and oxalic acid were of the "Blue Label Reagent" quality,

[1] A Further Study of the Diagnostic Value of the Colloidal Gold Reaction, together with a Method for the Preparation of the Reagent, Bull. Johns Hopkins Hosp., 1915, xxvi, 298.

[2] The formaldehyde always contains formic acid. Ten c.c. of the formalin used required 1.1 c.c. of $\frac{n}{10}$ NaOH for neutralization (phenolphthalein). The maximum limits of foreign substances in Merck's "Blue Label Reagent Potassium Carbonate" used were stated to be:

Heavy metals	0.0000 per cent.
Chlorides (Cl)	0.0020 "
Sulphates (So_3)	0.0075 "
Nitrates (N_2O_5)	0.0800 "
Potassium cyanide (CN)	0.0480 "
Sulphides (S)	0.0200 "
Sulphites (SO_2)	0.0080 "
Thiosulphates ($K_2S_2O_3$)	0.0800 "
Phosphates (P_2O_5)	0.0040 "
Silicates	0.0000 "
Aluminum (Al)	0.0400 "
Calcium (Ca)	0.0010 "

[3] 1.7 c.c. of 1 per cent. NaCl is necessary to precipitate completely 5 c.c. of colloidal gold in one hour. Five c.c. of colloidal gold will remain unaffected by 1 c.c. of 0.4 per cent. NaCl for an indefinite period.

the formalin U. S. P.; but there would seem to be no objection to using any good grade of chemicals convenient. The gold chloride was in sealed ampoules, and it is noteworthy that the weight of "gold chlorides" contained therein varies very considerably.[4]

The solutions were of the following strengths:

Gold chloride acid	1 per cent.
Potassium carbonate	2 "
Oxalic acid	1 "
Formaldehyde (37 per cent. CH_2O) 2.5 per cent (5 c.c. formalin made up with 200 c.c.).	

The solutions should preferably be freshly made, although all but the last keep very well. The oxalic acid probably does not deteriorate at all, but the potassium carbonate slowly tends to dissolve its container and incorporate silicates; the gold chloride is easily reduced upon exposure to dust or light, and the formaldehyde undergoes marked changes from oxidation, polymerization, etc.

It was assumed that since good solutions had been prepared with 10 c.c. of 1 per cent. $AuCl_3$ per liter, that that amount might not be considered excessive, provided that reduction was not carried too far. Keeping this constant, it was found that an increase of potassium carbonate tended to give violet and purple solutions. This was the experience of Miller, Brush, Hammers and Felton, and so the original amount of 7 c.c. was retained. These solutions, however, were invariably cloudy and more or less opaque. (Ten drops (0.43 to 0.58 c.c.) of oxalic acid and not more than 5 c.c. of formaldehyde were used.) The amount of oxalic acid was then gradually increased and a marked improvement was at once apparent. The solutions were very much more transparent and the minimum amount necessary to obtain the maximum transparency seemed to be about 1.75 c.c. This was also in accordance with the results obtained at Johns Hopkins, but the statement that "a large amount of oxalic acid without the subsequent addition of formaldehyde made clear 'satt rot' colloidal gold solutions" could not be verified. The solutions obtained in this laboratory were beautifully clear, but always blue or purple, although the conditions were varied within wide limits.

Finally, the formaldehyde factor was studied. It was evident from the behavior of the oxalic acid not only that the formaldehyde was essential to secure the ruby red color, but that it was responsible for the brown turbidity.[5] Beginning, then, with 5 c.c. the amount

[4] The contents of two tubes labeled as containing 15 grs (972 mgs.) of "Gold Chlorid Merck Acid" contained respectively 824 and 869 mgs.

[5] It is suggested that the brownish turbidity is caused by a suspension of reduced gold of almost molecular dimensions. Solutions which are fogged invariably deposit a brown precipitate transmitting violet light and resembling purple of Cassius and the violet gold precipitated from colloidal gold solutions by electrolytes. Such particles may have been caused by reduction by trioxymethylene (paraformaldehyde), and we have observed that when the Ostwald pipette used in measuring the formaldehyde is allowed to remain on the desk several hours, an amorphous white precipitate can be seen in the tip, and if the pipette is used a very cloudy solution results, whereas a clean dry pipette gives clear solutions.

was slowly reduced (1.75 c.c. of oxalic acid being used), and although for a long time no change could be noted in the appearance of the solutions, this very fact was proof that too much formaldehyde was being employed. Very suddenly, though, almost ideal solutions resulted, which, moreover, responded perfectly to known paretic spinal fluids. Flesch notes that he could not obtain good solutions unless he used much less than 10 c.c. of 1 per cent. formalin, usually 2 or 3 c.c.[6] The proper amount seems to be about 0.83 c.c. of 2.5 per cent., formalin containing 37 per cent., by weight of CH_2O, or 8.07 mg. of CH_2O per liter of colloidal gold made up.

In order, then, that the correct amount of formaldehyde should be used it is necessary to determine the value of the formalin. This may be conveniently done by a modification of the iodometric method of Ronijn,[7] which we have worked out as follows:

Evaluation of Formalin. Ten cubic centimeters of the formalin is made up to 1 liter with distilled water and 5 c.c. of this solution is mixed with 25 c.c. of decinormal iodin. Two normal sodium hydroxide is added drop by drop until the liquid becomes clear yellow. After ten minutes 2 c.c. of concentrated hydrochloric acid are added and the free iodin titrated with decinormal sodium thiosulphate. Two atoms of iodin are equivalent to one molecule of formaldehyde. If T equals the titration and S the specific gravity of the formalin, then

$$\text{Percentage of } CH_2O = \frac{75 - 3\,T}{S}$$

Up to this point the gold and alkali had been added at 60°, the oxalic acid at 80°, and the formaldehyde at 90°. The experiment was made of introducing all the chemicals initially, keeping the temperature just high enough to cause gradual reduction. The results were eminently satisfactory, and we have since been guided entirely by the color changes rather than by any definite temperature. This preliminary mixing of all the units of the reacting system insures their perfect and uniform distribution and eliminates the unfortunate and unavoidable local reduction effect entailed by the seriatim method of introduction of the reducing agents.

The following procedure has been finally adopted, and although it is not guaranteed to be infallible in giving ideal solutions; with a little experience it will be found not at all difficult to get 90 per cent. of the trials to answer every clinical requirement. As the cost of the chemicals is less than five cents per liter, and a dozen solutions may be prepared in an afternoon, it is no extravagance to discard even 50 per cent. of these should this be necessary.

Technic of Securing One Liter of "Satt Rot" Colloidal Gold. To 1 liter of distilled water in a clean flask add 10 c.c.

[6] Flesch: Ztschr. f. d. ges. Neurol. u. Psychiat., 1914, xxvi, 318.
[7] Ztschr. Anal. Chem., 1897, xxxvi, 18.

of 1 per cent. gold chloride, 7 c.c. of 2 per cent. potassium carbonate, 1.75 c.c. of 1 per cent. oxalic acid, and 0.83 c.c. of 1 to 40 formalin (37 per cent. CH_2O) or equivalent amount of 8.07 mg. of CH_2O per liter. Mix thoroughly, cover with a watch-glass, turn the burner on full and heat with occasional stirring to between 80° and 85°. Then reduce the flame enough to keep the temperature constant. The wire gauze supporting the beaker should be covered with a sheet of asbestos cardboard to prevent local reduction on that portion of the beaker directly over the flame. The solution will slowly develop through a series of colors substantially as given below, though some of the shades are much more transient than others. The associated temperatures are merely typical and were recorded for a development which lasted about an hour.[8]

When the solution reaches its maximum depth of color a remarkable lightening and change of color occurs within the space of a few seconds, and *until this rebound and transition of color has taken place the solution will be worthless for clinical purposes.* After this point has been passed, the burner may be turned out and the solution allowed to cool to room temperature, although if wanted at once there is no objection to cooling in running water.

If a solution is heavily clouded, pour it out and examine the flask for spots and streaks of reduced gold transmitting green, blue or violet light. If noticeably present, add a little aqua regia,[9] cover with a watch-glass and warm for a few minutes. Then rinse thoroughly and repeat the experiment. A clear colloidal gold solution leaves a clean container.

If the solutions still continue to be turbid and show a strong brownish fluorescence a series of 6 liters should be made with amounts of formaldehyde, decreasing and increasing by 0.05 c.c. from that originally used, and notice taken in which direction

[8] Kaplan observed that the color change comes gradually as a rule in good colloidal gold solutions: Ztschr. f. d. ges. Neurol. u. Psychiat., 1915, xxvii, 246.

Color.	Temperature.
Faint blue green	65°
Pale blue green	74°
Pale bluish lavender	78°
Bluish lavender	79°
Pinkish lavender	80°
Bluish pink	82°
Pale pink	83°
Pink	84°
Deep pink	84°
Violet red	84°
Bluish red	83°
Deep bluish red	83°
Deep ruby red	83°
Dark ruby red (violet red in test-tube or pipette)	83°
Rebound or color transition	83°
Orange red (orange pink in test-tube or pipette)	83°

[9] Seven volumes of concentrated hydrochloric acid in two volumes of concentrated nitric acid.

improvement occurs. We have observed that too little formaldehyde will cause cloudiness as well as too much.

It is perhaps advisable to keep the solution in the dark, but it is not necessary to keep it cold, and so far as we know the solution once made will keep indefinitely, certainly for several months. Contrary to the generally accepted requirement a slight brownish surface-dispersion was found to make no difference in the practical application of the colloidal gold. The practice of Kafka[10] of rejecting all solutions which are tinged blue may be adopted, and it may also be stated for the guidance of those making colloidal gold that the correct color is duplicated almost exactly (in a test-tube comparison) by a solution of 5 c.c. of 20 per cent. by weight of cobaltous nitrate ($Co(NO_3)_2.6H_2O$) plus 0.3 c.c. of 0.25 per cent., potassium bichromate ($K_2Cr_2O_7$) solution, plus 10 c.c. of water.[11]

A certain amount of black sediment often accumulates on the bottom of the colloidal gold solution, but this does not impair its usefulness.

The procedure given above applies to the preparation of 1 liter of colloidal gold at a time, and it is not advisable to experiment with quantities greater or less than that amount until some experience has been gained.

None of the solutions prepared by this method were of the protected type, and all of them gave typical curves not only with general paresis but with lues, tabes, and meningitis. No attention was paid to the question as to whether the final solution was neutral or not, but 5 c.c. of every solution prepared was completely precipitated in one hour by 1.7 c.c. of 1 per cent. sodium chloride, and no change of color whatever could be detected with normal spinal fluids.

In an article by H. S. Hulbert[12] the inherent disadvantages of formalin are discussed and a neat method is shown of avoiding these by utilizing formaldehyde vapor, oxalic acid being omitted, and the course of the reaction being guided by the color of the solution.

The tubes used for the clinical tests were heavy glass, lipless test-tubes, measuring $\frac{11}{16}$ in. to $\frac{3}{4}$ in. x 6 in. They are not readily broken in washing, and the point of the 1 c.c. pipette may safely be pressed against the bottom of the tube in order to avoid air bubbles and danger of spinal fluid being carried into the mouth of the operator. After using they are rinsed in tap water and immersed overnight in a 1 to 10 dilution of aqua regia. This effectually dissolves any precipitated gold which may be sticking to the glass, and which it is difficult otherwise to remove.

[10] Kafka: Deutsch. med. Wchnschr., 1913, xxxix, 1874.

[11] It is the intention to publish later the composition of a complete permanent standard colloidal gold color scale blended from inorganic constituents similar to the above, and based upon the colors observed with pathological spinal fluids.

[12] Technical improvement in Lange's colloidal gold test, Jour. Michigan State Med. Soc., January, 1916.

The 1 c.c. pipettes should be graduated to the tip, otherwise two measuring points must be determined and time lost by returning the amount in excess of 1 c.c. to the preceding tube. It is well to see, too, that there is a wide margin between the 1 c.c. mark and the top of the pipette.

Although in the usual technic the concentration of the spinal fluid in the tenth tube is 1 to 5120, the ratio of the total volume to the volume of the colloidal gold employed is higher than in the other tubes, unless 1 c.c. is removed from the tenth tube and rejected. This point is not clearly brought out in the descriptions of the technic which have come under our notice, with the result that the curves obtained before making this correction had an upward "kick" at their ends which was rather misleading.

CONCLUSIONS. 1. That colloidal gold solutions which conform to every clinical requirement (differential paretic, luetic, tabetic, meningitic, and normal curves) may be made with comparative ease.

2. That it is quite unnecessary to use other than ordinary distilled water from any convenient laboratory still.

3. That nothing is to be gained by elaborate precautions in cleaning the glassware used, and that apparatus washed with soap and water, rinsed in tap water, and hung up to dry has been found entirely satisfactory.

4. That the reagents used may all be introduced at the beginning of the experiment, and temperatures other than the final one disregarded.

5. That providing sufficient oxalic acid is present the only critical points involved are the amount of formaldehyde used,[13] and the passing of the color transition point at which the solution lightens and becomes orange red.

6. That solutions so prepared were of the proper color and transparency and precipitated properly with a dilute electrolyte.

7. That if a thick layer of the solution is transparent, and of the proper color, a certain amount of surface dispersion is no bar to its usefulness.

THE PRESENT STATUS OF HODGKIN'S DISEASE.[1]

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THE past five years have witnessed a wave of renewed interest in the subject of Hodgkin's disease. Inasmuch as the crest of this wave seems to have been reached, and possibly passed, it is perhaps

[13] This is in the vicinity of 17 per cent. of that recommended by Miller, Brush, Hammers and Felton.

[1] Read before the Chicago Society of Internal Medicine.

timely to review certain of the more important studies devoted to the condition with the view of determining, if possible, what of permanent value has been added to our knowledge.

PATHOLOGICAL CLASSIFICATION. Though Morgagni was the first to describe the clinical picture of this disease, the name of Hodgkin, who wrote *On Some Morbid Appearances of the Absorbent Glands and Spleen*,[2] is generally associated with the condition. As is commonly the case with first descriptions, Hodgkin's report included a variety of processes which today we know conclusively to belong elsewhere. For example, he grouped under a common heading not only cases of Hodgkin's disease in the strict sense, but also syphilitic and scrofulous tumors of the lymph nodes, metastatic carcinoma of the nodes, and still other conditions quite different pathologically from malignant granuloma.

Cohnheim, some thirty years later (1865), introduced the term pseudoleukemia as a fit one to portray the principal objective clinical feature of the same ill-defined group of diseases. In the light of our present considerably increased knowledge of the leukemias we can say, without fear of contradiction, that the name pseudoleukemia, whether applied to the motley group of diseases embraced by Hodgkin's report, or applied only to the well-demarcated condition called malignant, or infectious, granuloma, is a thoroughly unsatisfactory one, and should be reserved for the aleukemic leukemias of Türk,[3] with characteristic leukemic histological changes in the lymphatic tissues of the body, but unassociated with a leukemic blood picture.

The recognition of the true nature of Hodgkin's disease—using the term in the strict sense—as a granulomatous process with a fairly constant histological picture is a matter of scarcely more than fifteen years, and is associated with the studies of Sternberg,[4] Dorothy Reed,[5] McCallum,[6] Longcope[7] and others. We refer at this point not to the recognition of the particular form of the infection present, but in a general way to the fact that certain of the many conditions hitherto gathered under the inclusive caption of Hodgkin's disease were of the nature of granulomas and to be separated from the true leukemias, from sarcoma, from tuberculosis in its usual manifestations, and from syphilis.

As to terminology, we may conclude that we are justified in applying the term pseudoleukemia to the condition we are discussing only insofar as we imply that there exists a group of morbid

[2] Medico-Chirurg. Trans., 1832.

[3] Wien. klin. Wchnschr., 1903, xvi, 1073.

[4] Ztschr. f. Heilk., 1898, xix, 21; Centralbl. f. d. Grenzgeb. d. Med. u. Chir., 1899, ii, 641; also in Lubarsch-Ostertag, Ergeb. d. allg. Path., etc., 1903 (1905), ix, Part 2, 360.

[5] Johns Hopkins Hosp. Reports, 1902, x, 133.

[6] Tr. Assn. Am. Phys., 1902, xxii, 350.

[7] Bull. Ayer Clin. Lab., 1903–4; ibid., 1906, 86; ibid., 1907, 18; also in Osler and McCrae's System of Medicine, 2d edition, 1915, vi, 755.

processes of quite different etiology and microscopic characteristics, having in common merely the chief objective clinical feature of lymphoid leukemia, namely, the more or less generalized enlargement of the lymph nodes. Hodgkin's disease is a distinctly preferable term, and is acceptable when employed in the restricted sense of malignant or, better, infectious granuloma. With our tendency to slight the historical in medicine it is as well to preserve, so far as possible, in our nomenclature the names of historical significance.

The clarification of the subject of Hodgkin's disease began, therefore, with the separation of the granulomatous members of the larger group from the lymphocytomatous, *i. e.*, the leukemias and the lymphosarcomatoses. The next period, and this includes the present, has concerned itself with investigations into the character of the underlying infectious process. We may consider this phase of the subject under two heads: (1) the relation of Hodgkin's disease to tuberculosis, and (2) the position of the so-called Corynebacterium granulomatis maligni in the etiology of the disease.

HODGKIN'S DISEASE AND TUBERCULOSIS. Since the publication of studies by Sternberg, in 1898, 1899 and 1905,[8] in which he describes a peculiar form of tuberculosis of the lymph nodes, many conflicting reports have appeared bearing upon the relationship of Hodgkin's disease to tuberculosis. The histological picture of the Sternberg cases differs in no important detail from that which we are accustomed to regard as characteristic of malignant granuloma, as portrayed by Dorothy Reed,[9] Longcope[10] and others. Yet, whereas Sternberg was able in 15 out of 18 cases to establish a tuberculous etiology either by direct staining of the affected nodes or by animal inoculation, Reed, Warnecke,[11] Yamasaki[12] and others were uniformly unsuccessful in proving such an association.

Sternberg believed the assumption of a tuberculous etiology to be strengthened by the fact that in certain of his cases tuberculosis existed elsewhere in the body, and that in still other cases typical tubercles were present in the same nodes showing the peculiar granulomatous tissue. To account for the latter on a tuberculous basis, Paltauf[13] assumed an infection with an attenuated bacillus, and Benda[14] one with the toxins of the tubercle. More recently, however, observers generally have inclined to the belief that the tuberculous process in the granulomatous nodes was either an associated or a superimposed infection and unrelated to the malignant granuloma.

A new trend was given to work along these lines when Fraenkel

[8] Loc. cit. [9] Loc. cit. [10] Loc. cit.

[11] Mitth. a. d. Grenzgeb. d. Med. u. Chir., 1905, xiv, 275.

[12] Ztschr. f. Heilk., 1904, xxv, 269.

[13] Ergeb. d. allg. Path. u. pathol. Anat., 1896, iii, 652; also in Mráček's Handb. d. Hautkrankh., 1909, iv, Part 2, 681.

[14] Verhandl. d. Deutsch. pathol. Gesells., 1904, vii, 123.

and Much,[15] and in confirmation many others, isolated from lymph nodes showing the characteristic histological picture of infectious granuloma a granular, Gram-positive, antiformin but not acid-fast rod, which when injected into animals in the form of glandular emulsions produced in them typical tuberculous lesions. They called this organism, therefore, a granular form of the tubercle bacillus and believed it responsible for the peculiar histological picture of Sternberg.

In view of the recent bacterial studies devoted to Hodgkin's disease it would seem uncalled for, perhaps, to dwell at such length upon the role of the tubercle bacillus in the etiology of the condition. The matter cannot be entirely disregarded, however, (1) because the etiological association of any other known mycotic agent is still an open question, and (2) because careful workers are not wanting who continue to emphasize the relationship of the process to tuberculosis. Among others may be mentioned Steiger,[16] who, in 1914, published from the Eichhorst clinic a comprehensive clinical and experimental study in which he came to the not entirely novel conclusion that Hodgkin's disease was due to the bacillus of bovine tuberculosis. He apparently demonstrated, among other things, that patients with the disease who showed no response to any of the human tuberculin tests did react positively to the von Pirquet and Calmette tests when material from the bovine organism was used; and by employing glandular emulsions assumed to contain this organism, he reported that he was able to reproduce the typical granulation tissue in rabbits. It is possible that Steiger's results may be adduced in explanation of certain of the negative reactions in Hodgkin's disease obtained by observers who based their conclusions solely on the use of tuberculin from the human bacillus. This reasoning would not apply to negative inoculations tests in the guinea-pig, which, unlike the rabbit, is equally susceptible to the human and bovine organism.

To attempt to draw conclusions from these conflicting data bearing on the role of tuberculosis in the causation of Hodgkin's disease seems at present ill-advised, unless it be assumed, as suggested by some, that the typical granuloma of the disease is not of uniform etiology, but may be caused, on the one hand, by organisms still undiscovered, and, on the other, by the tubercle bacillus in one of the various forms already mentioned.

THE POSITION OF THE SO-CALLED CORYNEBACTERIUM GRANULOMATIS MALIGNI IN THE ETIOLOGY OF HODGKIN'S DISEASE. The history of the association of the pleomorphic, non-acid, but antiformin-fast organism, variously called a diphtheroid bacillus, the

[15] München. med. Wchnschr. (abstract), 1910, No. 10, 1035; ibid., 1910, No. 13, 685; Ztschr. f. Hyg., 1910, lxvii, 159. Fraenkel: Deutsch. med. Wchnschr., 1912, No. 14, 637.

[16] Ztschr. f. klin. Med., 1914, lxxix, 452.

Corynebacterium granulomatis maligni, and by the less conservative Bacterium hodgkini, from the first description by Fraenkel and Much[17] to the later ones of de Negri and Mieremet,[18] Bunting and Yates,[19] Billings and Rosenow[20] and others, is too recent to require recapitulation. The opinion of Fraenkel and Much as to the tuberculous character of this organism has already been alluded to. In this particular they differ from the great majority of later observers. Of the latter, Bunting and Yates have gone furthest in emphasizing the specific etiological character of this diphtheroid bacillus in Hodgkin's disease. For a time, indeed, their enthusiasm seemed well-founded, what with the occurrence of the organism, in one form or another, in practically all of their cases, their ability to obtain it in pure culture and their apparent success in transferring the disease in characteristic form to the rhesus monkey.

Since attention was first directed to this diphtheroid bacillus its presence in the granulomatous tissue has been amply verified. Positive reports far outnumber negative. Bunting and Yates, we believe, have demonstrated it in every one of their cases; while Billings[21] has recently reported that it was found in 40 out of 42 of his series.

This striking regularity of occurrence was at first naturally looked upon as very strong evidence of the specific etiological role of the diphtheroid bacillus. Recently, however, studies have accumulated which seem to take from this point much of its apparent weight. The following considerations merit special emphasis:

1. A diphtheroid organism has been found in a number of conditions seemingly unrelated to Hodgkin's disease. Steele,[22] and also Simon and Judd,[23] isolated the bacillus from the lymph nodes of lymphoid leukemia; Rosenow[24] has found it in arthritis deformans and in goiter, and Bunting[25] in chronic leukemia, lymphosarcoma, chloroma, Banti's disease, etc. In a case of von Recklinghausen's disease reported by Charles Elliott and the writer[26] the diphtheroid organism was apparently present in some of the subcutaneous nodules. It would appear that Bunting and Yates[27] have receded materially from their original emphatic stand relative to the specific nature of this bacillus in conceding that it is found in a number of conditions other than Hodgkin's disease. They assuredly do not

[17] Loc. cit.

[18] Centralbl. f. Bakt., orig., 1913, lxviii, 292.

[19] Arch. Int. Med., 1913, xii, 236; Jour. Am. Med. Assn., 1913, lxi, 1803; ibid., 1914, lxii, 516; Bull. Johns Hopkins Hosp., 1914, xxv, 177.

[20] Jour. Am. Med. Assn., 1913, lxi, 2122.

[21] Quoted from an abstract of the Tr. Assn. Am. Phys. (1916), in Jour. Am. Med. Assn., 1916, lxvi, 2031.

[22] Boston Med. and Surg. Jour., 1914, clxx, 123.

[23] Jour. Am. Med. Assn., 1915, lxiv, 20, 1630.

[24] Ibid., 1914, lxiii, 903.

[25] Bull. Johns Hopkins Hosp., 1915, xxvi, 179, 376.

[26] Jour. Am. Med. Assn., 1914, lxiii, 1358.

[27] Bull. Johns Hopkins Hosp., 1915, xxvi, 179, 376. Also Tr. Assn. Am. Phys. (1916), abstracted in Jour. Am. Med. Assn., 1916, lxvi, 2031.

strengthen their position by maintaining that those diseases in which the bacillus has been found—leukemia, lymphosarcoma, etc.—are genetically related because the same organism may be common to all. Finally, as pointed out by Bloomfield,[28] a diphtheroid bacillus may be present in lymph nodes which are apparently in normal condition.

2. In addition to the diphtheroid bacillus, other organisms are not infrequently found in Hodgkin's gland. Thus Rosenow,[29] while able to cultivate the diphtheroid bacillus from all of 40 cases, found in 17 of these cases a staphylococcus, in 7 the Streptococcus viridans, in 14 an organism resembling Bacillus welchii, and in 6 Gram-negative bacilli. The coexistence of the diphtheroid bacillus and the tubercle bacillus has already been commented upon.

3. Immunological studies have cast serious doubt upon the specific character of the organism in question. Olitsky,[30] and more recently Moore,[31] were able to obtain what appeared to be satisfactory antigens in their work, and yet in only one of their cases, this being one of Moore's series with syphilis in addition, did they observe fixation of complement. Nor, in the process of active immunization with these organisms, did Moore obtain an increase in the specific agglutinative power of his patients' sera. These findings, while not conclusive, are highly suggestive, for with a satisfactory antigen one may look for the fixation of complement if the antigen be specific.

4. The cultural studies of Bloomfield:[32] Bloomfield, in a mixed series of cases, some with practically normal lymph nodes, others with a distinct pathology, isolated 29 different strains of organisms. More positive cultures were obtained from diseased than from relatively normal glands. No correlation was evident between a given organism and a specific tissue change. The relative avascularity of the lymph-glandular tissue possibly predisposes to the localization of microörganisms, some of which may be traced to contiguous infections while others are saprophytic and correspond to the flora of the body surfaces. Belonging to the latter class is the pseudodiphtheria bacillus, which would account for its occasional presence in normal glands and its frequent or, as the case may be, regular occurrence in pathological tissues which favor its growth.

As to the conveyance of the disease to animals, reports are not entirely in accord. Bunting and Yates have stated that it was possible to reproduce the disease in typical form in the monkey, regularly, provided the organism injected was not too virulent and the injections not too frequent to cause the early death of the animal. Moore,[33] on the contrary, was unable to produce a lesion

[28] Arch. Int. Med., 1915, xvi, 197.
[29] Jour. Am. Med. Assn., 1914, lxiii, 903.
[30] Ibid., 1915, lxiv, 1134.
[31] Jour. Infect. Dis., 1916, xviii, 569.
[32] Loc. cit.
[33] Loc. cit.

resembling that of Hodgkin's disease in his work. Rhea and Falconer[34] had obtained no results in the conveyance of the disease to a monkey up to the time their paper was published, and no further report, so far as we know, has come from them. Lanford,[35] using the guinea-pig, was likewise unsuccessful. And, finally, the entire matter is further obscured by the work of Steiger,[36] already referred to, in which by means of the bacillus of bovine tuberculosis, he produced the granuloma in the rabbit.

Though the question of the relation of the diphtheroid organism cannot be called a settled matter, the evidence against its being the specific cause of Hodgkin's disease is constantly increasing, so that we are perhaps not premature in concluding that little of the original contention of Bunting and Yates has stood the test of recent studies.

Of less importance than the foregoing matters, but perhaps worthy of mention at this time because of the emphasis laid upon it by some, is the subject of the blood picture in Hodgkin's disease. The extreme position here, as in the case of the diphtheroid organism, has been taken by Bunting and Yates. The former[37] has maintained that he was able to make a highly probable diagnosis of the condition merely by the examination of the blood smear, the most characteristic feature, according to him, being, as is well known, a relative, and, as a rule, also absolute increase in the large mononuclear and transitional cells. Bunting's data indicate that such an increase is present throughout the course of the disease, as a rule, but we believe that special emphasis has been laid upon the mononuclear increase in the early stages. The other suggestive findings, according to Bunting, are the increase in the number of blood platelets, many of which are abnormally large, and the presence of detached pseudopodia of megalokaryocytes. Bunting is in accord with observers in general with respect to the other characteristics of the leukocytic blood picture, namely, a practically normal white cell count—or, possibly a slight leukopenia or a slight leukocytosis—in the early stages of the disease, and a variably high leukocytosis of the polynuclear type with a marked and progressive diminution of the lymphocytes in the advanced stages. An eosinophilia, in addition, may be present.

In the literature subsequent to the appearance of Bunting's articles on this subject we have been able to find only the most meager reference to the matter of blood platelets and megalokaryocytic pseudopodia. As to the increase in the large mononuclear and transitional cells there seems to exist a considerable difference of opinion. Steiger reports a relative lymphocytosis in the

[34] Arch. Int. Med., 1915, xv, 438.
[35] New Orleans Med. and Surg. Jour., 1915, lxvii, 983.
[36] Loc. cit.
[37] Bull. Johns Hopkins Hosp., 1911, xxii, 114, 369; ibid., 1914, xxv, 173.

early phases of the disease, a marked polynuclear leukocytosis in the most active middle period, and a progressive diminution of the lymphocytes as fibrosis advances. Billings and Rosenow speak of a moderate leukopenia with a relative increase of the small mononuclear cells in some of the afebrile patients and of a leukocytosis with the usual leukocytic formula in most of the febrile patients. Moore[38] found in an inoculated monkey an average large mononuclear count of 4.79 per cent. as against a percentage of 10.73 per cent. as recorded by Bunting and Yates in their animal work. Naegeli[39] and others, on the contrary, regard an increase in these cells as of frequent occurrence in Hodgkin's disease.

Thus in this matter, as in the majority of the other subjects we have considered, there is no unanimity of opinion. However, we believe that hematological studies warrant the following conclusions regarding these cells:

An increase, when present, does not point to a specific reaction of the Hodgkin process upon the structures of the lymph nodes, because the great preponderance of evidence goes to show that the large mononuclears arise not in the germinal centers of the lymph glands, as is maintained by some, but are products of the myeloid system.[40] Neither in Hodgkin's disease nor in any other condition do these cells run parallel to the lymphocytes. On the contrary, it has been amply shown that they increase and decline in number, *pari passu*, with the other cells of the granular system. In the second place, Hodgkin's disease is not the only condition producing destructive changes in lymph nodes which is associated with an increase in the cells in question. A similar increase is seen not infrequently in tuberculosis and in metastatic carcinoma of the lymph nodes, for example. It would appear, therefore, that the percentage increase in the large mononuclears and transitionals is rather a bone-marrow than a lymph-node reaction, and has the same significance in Hodgkin's disease as does the increase in the polynuclear neutrophiles, the eosinophilia, and the presence of occasional myelocytes, namely, the bone marrow response to infections in general.

A final word as to treatment. In a process of this kind, which is in all likelihood of an infectious nature, progress in treatment may be expected to go hand in hand with an increased knowledge of the character of the infectious agent. Our early hopes in vaccine therapy have declined with our increasing doubt of the specificity of the so-called Corynebacterium hodgkini; and, although we still hear of cases which derive apparent benefit from vaccines, we believe that this method of treatment is gradually falling into disuse. Surgical intervention offers hope in no greater degree, perhaps,

[38] Loc. cit.
[39] Blutkrankh. und Blutdiagnostik, 2d edition (1912), 187.
[40] In this connection see the recent work of Evans: Arch. Int. Med., 1916, xvii, 1.

than in malignancy, namely, insofar as the affected tissues can be removed completely, which is rarely possible. If the Hodgkin process can be conclusively linked with a definite source of infection, and that source be eradicated before the disease has made too great progress, a cure may perhaps be hoped for. Meanwhile we must content ourselves with our earlier methods, namely, arsenic, the roentgen rays, and possibly radium.

ASTHMA CONSIDERED IN ITS RELATIONSHIP TO THE VEGETATIVE NERVOUS SYSTEM.[1]

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With our more extended knowledge of viscereal neurology we are able to form more definite ideas regarding so-called visceral neuroses; and such conditions as hay fever, asthma, hyperchlorhydria, and spastic constipation can now be studied from a standpoint which offers to help solve many of the questions regarding them which have heretofore been misunderstood. These various clinical manifestations have been heretofore classed among the diseases of the organ or part affected, but our newer knowledge makes it plain that this is a mistake. They are evidences of reflex action. These phenomena are manifestations in different organs of the same syndrome, that of increased vagus stimulation. To make this clear it is only necessary to recall our physiology.[2]

The Vegetative or Involuntary Nervous System. That part of the nervous system which is not under direct control of the will is called the vegetative or involuntary, sometimes also the autonomic. It supplies:

1. The subdermal musculature (pilomotor muscles and muscles of sweat glands).
2. Heart and bloodvessels.
3. Muscles and glands of the respiratory tract.
4. Muscles and glands of the gastro-intestinal tract, including the salivary glands, liver, and pancreas.
5. Genital tract.
6. Urinary tract.
7. The ciliary body, pupil and lacrimal gland.
8. All other smooth muscle and glandular structures of the body.

[1] Read before the Thirty-fourth Annual Meeting of the American Climatological and Clinical Association, Lakewood, N. J.

[2] Pottenger: The Vegetative Nervous System in Relation to General Medicine, Read at Annual Meeting of California State Medical Society at Coronado, April 17–19, 1917, California State Jour. of Med., November, 1917.

Throughout the entire body the principle of action and counteraction is evident. This we see in the flexors and extensors, in inspiration and expiration, and in vasoconstriction and vasodilatation. Normal function is preserved by maintaining an equilibrium between the acting and inhibiting forces.

The vegetative nervous system is divided into two distinct divisions: one originating in the medulla, bulb, and sacral portion of the cord, the other in the thoracic and upper lumbar segments of the cord. These two divisions are antagonistic to each other. They each give fibers to most of the important internal viscera and structures, including the heart, possibly some bloodvessels (all receive sympathetic fibers), bronchi, stomach, intestines, liver, pancreas, and genital and urinary organs. In each structure supplied by both, one produces action, the other inhibition. That division coming from the thoracic and upper lumbar segments of the cord is called the sympathetic nervous system; the other is called the *greater vagus*. The term greater vagus is applied to all the vegetative fibers that do not belong to the sympathetic system, and is named for the tenth cranial nerve, which is the most extensive nerve in its distribution of the division. It comprises the vegetative fibers in the third, seventh, ninth, and tenth cranial and those in the pelvic nerve. When these two divisions of the vegetative nervous system are in normal tone, normal physiological action takes place; but when one is overstimulated the equilibrium is destroyed and pathological action results.

ANTAGONISTIC ACTION OF THE SYMPATHETIC AND GREATER VAGUS DIVISIONS OF THE VEGETATIVE SYSTEM. The antagonism of these two systems shows in the following manner in a few of the more important structures of the body.

Eye. Sympathetic dilates pupil and contracts Müllerian muscle, greater vagus contracts ciliary body and pupil and increases lacrimation.

Salivary Glands. Sympathetic decreases secretion; greater vagus increases secretion.

Stomach. Sympathetic decreases motility and secretion, including hydrochloric acid; greater vagus increases motility and secretion, including hydrochloric acid.

Intestines. Sympathetic decreases secretion and motility; greater vagus increases secretion and motility.

Liver and Pancreas. Sympathetic decreases secretion; greater vagus increases secretion.

Nose and Accessory Sinuses. Sympathetic constricts vessels, decreases sensibility and decreases secretion; greater vagus dilates vessels, increases sensibility and increases secretion.

Bronchi. Sympathetic relaxes muscle tone and decreases secretion; greater vagus causes spasm of bronchial musculature and increases secretion.

Heart. Sympathetic increases rapidity of action; greater vagus slows.

Bloodvessels. Sympathetic causes vasoconstriction; greater vagus in some parts causes vasodilatation.

Blood-forming Organs. While it is not possible to be definite in this matter, yet it has been noticed that conditions which cause increased sympathetic stimulation are accompanied by leukocytosis, with the increase largely in the number of neutrophiles; while those conditions which cause increased stimulation of the greater vagus are accompanied by increased lymphocytosis, eosinophilia and decreased coagulability of the blood.

ASTHMA A PART OF THE SYNDROME OF INCREASED GREATER VAGUS STIMULATION. With these physiological considerations it is evident that the symptoms of asthma belong to a group which results when the greater vagus is overstimulated. The principal symptoms of asthma are dyspnea and cough. These are due to an increased secretion in the glands of the bronchial mucous membrane and a spasm of the bronchial musculature. Emphysema is also an accompaniment in many cases. There is also commonly an increase in eosinophiles in the sputum. This picture is clearly that of overstimulation of the vagus.

The rapid heart is due to sympathetic stimulation and shows how Nature in her effort to preserve the individual provides that the essential body functions be carried on. In asthma we would expect the heart to be slower than normal if the same vagus stimulation extended to the cardiac vagus, but if it did, life would be endangered by failure of oxygenation; so, as diminished oxygenation results in acid retention, the vasomotor center in the brain is stimulated and vasoconstriction with increased rapidity of heart beat takes place and a partial equilibrium is maintained. While oxygenation may not be fully carried on, in fact rarely is, yet a degree which is sufficient to meet the immediate necessities is usually established and maintained until the emergency is passed.

Medical literature is filled with speculation regarding the cause of asthma. Many have thought that the associated bronchitis must be the cause. This idea has been strengthened by the fact that the secretion lessens as the spasm lessens. This may be explained, however, by the fact that both spasm and increased secretion are results of vagus stimulation. We are not in a position to say, however, that the presence of the secretion on the mucous surface does not further irritate the vagus endings and prolong the attack. This is possible. It is also possible that vagus stimulation might call forth a different response in the muscle fibers and the secretory glands according to the strength or other characteristics of the stimulation. The one fact that is of prime importance in understanding the nature of asthma is that the essential conditions, bronchial spasm, increased bronchial secretion and cough (dyspnea and emphysema being

results), likewise the increase of eosinophiles in the sputum, are conditions which are met when the equilibrium in the vegetative nervous system is disturbed in such a manner that vagus tonus predominates.

There are also, doubtless, changes in the glands of internal secretions which result from this disturbed equilibrium. What they are and whether they are within normal limits of variation we do not know, but must leave for further study.

That vagus stimulation is the factor which is accountable for the symptoms cannot be doubted. This is the reason why atropin and adrenalin are the remedies of greatest value for relieving the asthmatic attack. Atropin depresses the action of the vagus, and if it could be given in doses sufficiently large would undoubtedly relieve asthma; but its drying effect on the secretions is so marked that doses which are required for the relaxation of the bronchial spasm cause too great discomfort.

Adrenalin opposes the action of the vagus by producing the same effect in the tissues as would result from central stimulation of the sympathetics. I have listened through the stethoscope to a severe attack of asthma accompanied by many squeaks and rales, and note it disappear and the breathing become smooth and almost free from asthmatic signs within three minutes after the injection of 20 minims of a 1 to 1000 solution of adrenalin.

Another observation which tends to show definitely that asthma is due to vagus stimulation is the manner in which asthma is at times influenced by toxemia. Toxins cause an increased tonus in the sympathetic system.[3] Several patients who have come under my care have been relieved of asthmatic attacks by intercurrent infections—one by a tonsillitis, another by tuberculous toxemia, and a third by a pneumonia. These I have discussed more fully elsewhere.[4] Whether a case will be relieved by atropin, adrenalin, or by such intercurrent toxemias as just mentioned depends upon whether or not the sum total of the sympathetic stimulation or the depressing action as produced by atropin is able to counteract and inhibit the increased vagus tonus.

Causes of Increased Tonus in the Pulmonary Vagus. *Vagotonic Disposition.* The first fact bearing on this point is the one which has been emphasized in vague terms for many years, without any definite conception of its meaning, namely, that there is a certain inherited nervous basis back of asthma. Studies in visceral neurology show what this is. Eppinger and Hess[5] have particularly visualized this condition under the term "vagotonia." While equilibrium is maintained in the structures supplied by the vegetative system by the tonus in the sympathetic nerves equal-

[3] Pottenger: The Syndrome of Toxemia, Jour. Am. Med. Assn., January 8, 1916.
[4] Pottenger: Clinical Tuberculosis, C. V. Mosby Co., St. Louis, 1917.
[5] Vagotonia, English Trans. Nervous and Mental Disease Pub. Co., 1915.

ling the tonus in the greater vagus there are many individuals in whom the balance is slightly or markedly on the vagus side. If not already on that side it may be thrown to it by any extra irritation of the nerve centers by which their threshold of response is lowered. This often follows overwork, disease, worry discontent, and other depressive emotions and the neurasthenic and psychasthenic states. While nerve equilibrium may be maintained under ordinary, favorable states it is quickly destroyed by conditions which produce harmful stimulation of the nerve centers. A vagotonic may not show the complete syndrome of vagotonia. Only one or a few structures may show the influence of overstimulation. Thus one patient may have increased irritability of the lacrimal glands and nasal mucous membrane and show hay fever; another of the bronchi and suffer from asthma; while still others may show the symptoms most marked in the gastro-intestinal tract and suffer from hyperchlorhydria, spastic constipation, and intestinal stasis.

We conceive that a patient who is distinctly vagotonic might have not only a widespread predominance of vagus stimulation but also increased tonus, the expression of which is limited to one or more branches of the greater vagus. When limited to the pulmonary branches asthma results. It is not beyond conception that asthma might exist because of a specially low threshold of response in the cells which give origin to the pulmonary branches of the greater vagus in an individual who is decidedly vagotonic. Under these conditions a much less stimulus is adequate than under conditions of normal nerve tonus. In spite of this assumption, however, I am convinced that when the etiology is carefully worked out that we shall find that either peripheral irritation of the pulmonary vagus endings or reflex stimulation from irritants affecting filaments of the greater vagus in other internal viscera will be found to be the predominant factors which increase the already existing predominant vagus tonus.

It has long been supposed that the gastro-intestinal canal is specially liable to be the source of reflexes which cause asthma. Bearing on this point I should call attention to the fact that embryologically the lungs are formed from a diverticulum from the intestine. This fact makes the respiratory and digestive tracts closely associated in their innervation. In my study of pulmonary tuberculosis I have found this fact very evident. The inflammation in the lung apparently causes reflex stimulation in the gastric and intestinal branches of the vagus more regularly than in any other structures outside of the respiratory tract.

Let us now turn our attention more particularly to the study of those factors which might either directly or reflexly cause increased pulmonary vagus stimulation and precipitate the syndrome recognized in asthma.

Causes Acting Directly on the Pulmonary Vagus. It seems to me that it is probable that the condition of the atmospheric air is a factor in the production of asthma. Observation of a number of asthmatics at the same time (in Southern California) has shown me that while all will not suffer attacks at the same time, yet several will; and further, that the attacks seem to be precipitated by changes in weather. The factors in the atmosphere which seem to be potent in producing the attacks are apparently more active during changes from normal humidity to increased dryness or increased dampness. It would seem that the musculature and mucous membrane of the bronchi are not able to adjust themselves readily to the changes and that irritation results. Fog at times is sufficient to produce the adequate stimulus for an attack. Those who have leaned toward the theory that asthma is due to bronchitis have explained the attacks following foggy and damp weather as being due to an increased bronchitis.

It may be that dust and other irritants in the atmosphere are also factors in some cases. The action of all of these factors may be either direct on the pulmonary vagus, or, what seems more reasonable, upon the nerve endings in the upper air passage and larger bronchi, the asthma being a result of the reflex.

Asthma, now and then, seems to be due to direct irritation of the pulmonary vagus from conditions within the thorax. I have seen attacks follow rapidly forming fibrosis in tuberculosis, either with or without marked shifting of the diaphragm. It seemed that the direct irritation of the vagus endings in the lung was most probably the determining factor, yet we cannot exclude the possibility of protein irritation resulting from the change in the pulmonary tissue.

Causes of Reflex Stimulation of the Pulmonary Vagus from Other Viscera. Irritations which occur in the upper air passages have just been mentioned, but there are many sources of reflexes which may cause increased tonus in the pulmonary vagus.

Asthma sometimes accompanies hay fever. In this case it would seem that what irritates the nerve endings of the upper air passages locally stimulates the pulmonary vagus reflexly.

Deflected septum, pressure, polypi, and sinus infections at times cause asthma. The chief factor in each of these conditions seems to be a reflex stimulation, although in case of polypi and sinus infections so-called protein poisoning may be a factor, as will be evident as our discussion proceeds. Irritation in the nose, however, may be a result of the same vagus stimulation as that which produces the asthma instead of being an exciting cause of the asthma.

Next to the respiratory tract, for embryological reasons, as previously mentioned, irritation in the gastro-intestinal tract should be the most apt to cause reflex stimulation in the pulmonary vagus, and this has long been believed. Cardiac asthma is also spoken of; and we now and then see cases reported in which the

reflex cause seemed to be in the genital or urinary tracts. The various neurons of the greater vagus are closely bound through the ascending and descending fibers in the cord, so that stimulation may excite reflexes in far distant organs. We know vomiting may be reflexly caused by ovarian and uterine irritation; why not asthma as well?

Anaphylaxis. There has been a growing tendency in recent times to appreciate more fully than formerly that the body tissues often find themselves confronted with foreign substances which have passed through the normal protective defences. Thus foreign substances may pass through the mucous membranes of the upper air passages, and undigested food may pass the protective cells of the intestinal mucous membranes. In the destruction of these foreign substances certain reactions occur. One is recognized as toxic, another as anaphylactic; the former expresses itself through the sympathetic portion of the vegetative nervous system, the latter through the greater vagus. These I have discussed more fully elsewhere.[6]

When the substance which enters the tissues of the body is a foreign protein, sensitization of the body cells takes place. When the same protein enters again the cells are better able to destroy it because they are endowed with the power of producing specific defence. The destruction of the protein is accomplished by biochemical reaction. As a result nerve endings are irritated. When nerve endings of the vegetative nervous system in internal viscera are irritated the sympathetics cause segmental reflexes through the sensory and motor spinal nerves, while the greater vagus filaments cause reflexes in other internal viscera. Protein in the process of being broken up circulates in the tissues and may irritate the nerve endings of one branch of the greater vagus more than another.

The biochemical reactions which are associated with the parenteral elaboration of foreign protein cause the syndromes of toxemia and anaphylaxis. These are closely related to reactions which result from the breaking down and elaboration of native protein during inflammatory processes. Here we have foreign protein also in all cases of infectious inflammation. In the destruction and elaboration of the protein of one's own tissues during inflammation the syndrome of toxemia is often present. The reaction which seems to be more particularly due to the cleavage and further elaboration of the non-toxic protein molecules expresses itself not as the syndrome of acute anaphylaxis, but, in more or less widespread vagus reflexes, in other organs. The syndrome which is recognized as anaphylaxis, either acute or chronic, and the symptoms indicative of vagus stimulation which result from visceral inflammation, seem to be

[6] Pottenger: The Relationship of the Syndrome of Anaphylaxis to the Vegetative Nervous System. Read before American Association of Immunologists, April, 1917, New York Med. Jour., August 18, 1917.

related, but the latter, as a rule, are less acute than the former. It is possible that the only difference may be the greater part taken by the cells in defending the body against foreign protein.

It has been my observation that patients who show increased tonus in the pulmonary branches of the greater vagus (asthma) are prone to have increased vagus tonus in one or more other organs. Hay fever, hyperchlorhydria, spastic constipation, and intestinal stasis are commonly found in patients who suffer from asthma.

Study of asthma in relationship to the vegetative nervous system shows it to be, in all probability, a condition with a varied etiology. In closing I wish to quote my conception of asthma from one of my recent discussions:[4] "Asthma is a disturbance in function. It is an increase in tonus of that portion of the greater vagus nerve which supplies the bonchial musculature and mucous membrane. Its cause may be as diverse as the irritants which may be applied to the nerve centers which give origin to the pulmonary fibers or to the peripheral nerves that are in reflex relationship with them. As all toxemias which are sufficiently severe may produce the toxic syndrome, so all irritations, either reflex or central, which produce sufficient stimulation of the nerve cells giving origin to the pulmonary filaments of the vagus may produce asthma."

[4] Pottenger: Loc. cit.

WAR MEDICINE

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WAR NEUROSES AND PSYCHOSES.[1]

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UNDER contemporary conditions of warfare the subject of nervous and mental disorders assumes much greater importance than ever before in military psychiatry.

In addition to familiar pathological states found in civilians and soldiers alike, in peace and war, there have developed various peculiar conditions for which new names have been found. Together they

[1] This article was contributed for the Manual of War Medicine which was to be edited by the late Dr. Lewis A. Stimson, but owing to the death of Dr. Stimson the publication had to be abandoned.

constitue the *war neuroses*. These conditions, while presenting nothing absolutely new in symptomatology, have nevertheless an individuality of their own precisely in the sense that their exciting causes and the circumstances under which they develop have never hitherto existed.

Frequency. The Surgeon-General's report covering the year 1915 shows that 25.6 per cent. of all discharges from the service were due to nervous and mental disease. In war, although the actual number of these diseases multiplies, the percentage decreases in the presence of the mounting casualties. Among Canadian soldiers invalided home, 1915–1917, they have constituted approximately 10 per cent.[2]

Another war difference is in the general type of disorder. During peace psychoses far outnumber the neuroses (8 to 1, U. S. Army, 1915). In war the relations are reversed, neurotic reactions making up 50 to 60 per cent. of the total nervous and mental disabilities.

The chief interest of war psychiatry is therefore in the neuroses. Their discussion should be prefaced, however, (1) by a statement of certain general characteristics of war psychopathology, and (2) by brief mention of the commoner psychoses and defect states which medical officers may be called upon to handle.

Fallacious Sense Perceptions. The circumstances leading to illusions and hallucinations of sight and hearing, and their types, are too obvious to require mention. The strained listening and watching by day, and particularly by night, especially when combined with physical exhaustion, are only too prone to render the evidence of the senses misleading.

Closely related are *battle dreams*, in which the patient again and again lives through his most harrowing experiences. *Somnambulistic and waking dream states* are not infrequent. In these all the maneuvers of conflict may be enacted, and unless safeguarded the invalid may injure others or come to grief himself by rushing into exposed places or charging headlong into some natural obstacle, *e. g.*, the wall of the room.

Special Delusional Trends. In depressive states, in which a civilian might harbor ideas of sin, moral delinquency, etc., the soldier reproaches himself with cowardice, failing in his duty, or takes undue blame for some disaster.

Men by nature suspicious, oversensitive, or in any way peculiar, are badly off in the army. Camp and field life is not tempered to them, and they may easily become victims of thoughtless teasing. From the individual's point of view this may amount to actual persecution, which, according to circumstances, he may pathologically exaggerate and grotesquely elaborate.

The spy delusion is quite common. The most damning thing that can be said of a man is that he is an enemy spy. Consequently the suspicious soldier easily becomes obsessed with the idea of being so regarded, especially if he has been subjected to actual teasing on account of enemy ancestry or a suggestive name. Incipient paranoiacs often express this delusion.

[2] This figure includes bullet and shell wounds of the skull, with or without brain lesions, representing about 1.5 per cent. of the total discharge disabilities.

Malingering. The practice of deception in one form or another, including self-deception, is very common. The habit of parading sick to avoid distasteful duty begins in camp and continues at the front for the same reason. It is perhaps hardly likely that the experienced medical officer will err on the side of overcredulity toward questionable disabilities. But unfortunately the skeptical attitude is sometimes overworked. Men have been undeservedly court-martialed and shot, as examples, through too-ready assumption of malingering.

It may be useful to distinguish the following conditions.

1. *Simulated Malingering.* This refers to certain pathological mental states with partial or complete irresponsibility, *e. g.*, early dementia precox, in which the symptoms themselves may suggest feigning.

2. *Exaggeration and Perseveration.* In actual disabilities symptoms are readily exaggerated subjectively, usually inversely to the gravity of the cause. This may be partly a voluntary matter, partly a temperamental reaction, and is not confined to the army. Still there is a lesson in the story of an old R. A. M. C. officer who is said to have handled his sick parade by giving treatment to all the odd numbers and returning the even numbers to duty.

Perseveration means the indefinite continuation of symptoms after the original cause has subsided. Habit tendencies here play a part. In conditions accompanied by pain perseveration may extend over many months, with no discoverable basis. Pain being a sensation which in many cases comes and goes at suggestion, the eventual question is, to what degree is the invalid himself persuaded of its existence? Again, in joint conditions, with original limitation or suspension of movement from whatever cause, voluntary motion may remain in abeyance indefinitely, without any anatomical or neurological grounds. Wherever advantage may accrue it would appear that perseveration may take place with a minimum of conscious participation.

3. *Hysterical Autosuggestion.* In this it is unnecessary to assume any organic lesion whatever underlying the symptoms presented. Many of the so-called shock symptoms, aphonia, deafness, paralysis, contractures, stammering, etc., belong in this category. The psychogenesis of these manifestations is that of hysterical symptoms in general.

4. *Mental Contagion.* Suggestion plays a self-evidently large part in war psychopathology. In its simplest form it amounts to nothing more than purposive collusion or limitation. It has happened, for example, that numbers of men in the same battalion have developed the same form of dermatitis, at about the same time, and from the same irritant self-applied.

Less directly conscious imitation is notoriously effective in the production of neurotic symptoms. Charcot's hysterics all followed more or less the same pattern. The specialist who is interested in any particular neurotic manifestation is likely to find it in all his patients. There is a conspicuous similarity in the symptomatology of the war neuroses which may be attributable partly to like causes.

5. *Voluntary Fabrication.* A not uncommon attempt to short-cut from active duty or awarded punishment is by way of feigned or artificial disability. A bare catalogue of these simulated conditions would make a long chapter.

They include factitious skin eruptions, abscesses and ulcers; con-

tusions, erythematous infiltration from self-inflicted blows repeated at intervals; picric acid jaundice (the French call these malingerers "carrots"); self-inflicted bullet wounds (also occasionally in dementia precox); edema of extremities from constricting bands (even to the degree of resembling elephantiasis); hemoptysis from pricking the throat; conjunctivitis from application of ipecac, tobacco, etc., repeated until chronic hyperplasia and scarring, even ectropion results; simulated otitis media by introduction of pus-like substances or genuine inflammation from instillation of irritants (sometimes a *bona fide* otitis furnishes the cue for an artificial disabling exacerbation); gastritis and gastro-enteritis from the ingestion of noxious substances; disordered action of the heart from swallowing tobacco; artificial diabetes; simulated pain and stiffness of joints; feigned amnesia, deafness, blindness, convulsions, automatism.

In dealing with any case of supposed malingering it is paramount to give careful attention to the mental state of the suspect. After eliminating actual mental disease a degree of psychopathic inferiority or defect with diminished responsibility may be demonstrable.

We pass to a review of the principal mental diseases encountered in the service.[3]

Dementia Precox. Slowly developing psychosis: Apathy, inertia, defective sense of personal identity, feelings of control by external agents (electricity, hypnotism, etc.), aural hallucinations (abusive voices), irrelevant and incoherrent thought and action, with inappropriate emotional expression, meaningless smiling, frequent response "I don't know" to questions, purposeless impulsive (often dangerous) acts, suspicional attitude toward comrades, with morbid self-centering

Several points deserve special mention:

1. In the first place, dementia precox is by far the commonest psychosis occurring in the service in peace or war (at least 60 per cent. of all insane cases according to King). This preponderance is due to the fact that the usual age of onset coincides with the military age; and, further, to the nature of the precox constitution itself, a certain number of potential schizophrenics constantly drifting into the service.

2. In cases of suspected malingering, insubordination, repeated petty crimes and irresponsibility and inefficiency in general it should first be determined whether or not the delinquency is symtomatic of this disease. The behavior of precox patients in the early stages, their trifling evasive responses or sullen indifference, together with a tendency to alcoholic excesses, neglect of duty and frequent vague physical complaints, may easily arouse the suspicion of wilful perverseness or simulation.

3. Recognition of the psychosis may be delayed by a practically complete remission of symptoms, which may thus lend weight to the suspicion of malingering. Even when symptoms have become conspicuous and a medical board has certified the presence of mental disease, a second board, sitting a few weeks later, may be unable to find any abnormality and pronounce the man sane and fit. In due time a second revision of opinion of course becomes necessary.

[3] For an excellent presentation of military psychiatry in time of peace consult King's Mental Disease and Defect in United States Troops, War Department Bulletin No. 5, Government Printing Office, Washington.

MANIC-DEPRESSIVE PSYCHOSIS. Psychosis characterized by recoverable phases of emotional depression with feeling of incompetence and varying degree of inhibition in thought, speech and action on the one hand, and exhilaration, hyperactivity and talkativeness on the other. These phases may occur independently or in succession. Sometimes the symptoms of both are mingled.

Although transitory episodes of motor excitement under shell fire are sometimes observed, true manic or depressive syndromes are comparatively rare in the army, the latter being the more frequent.

Depressed cases may become self-accusatory and seek punishment for alleged crimes or dereliction in duty. The point to be emphasized before all others is that every case of affect depression is a potential suicide.

Hypomanic excitement is easily mistaken for alcoholic exhilaration. There are instances of mild manics being arrested as drunk and disorderly, although quite free from alcohol. On the other hand, the two conditions are often associated, both phases of the manic-depressive psychosis, in fact, predisposing certain individuals to alcoholic excesses.

PARESIS AND TABOPARESIS. Progressive, fatal disease of central nervous system following syphilis. In paresis, brain involvement and mental symptoms predominate. Speech and hand-writing defects, tremors, defective pupillary light reaction, silly euphoria, dulling of moral sense, memory defects, progressive mental decay. In tabes, cord lesions and symptoms are foremost. Defective pupillary light reaction, absent knee-jerk, ataxia, impaired sphincter control, pain crises, etc.

It is inevitable that a considerable number of enlisted men will have antecedent specific history; also that in a certain percentage the concomitant factor of personal predisposition, alcoholism, stress or what not will lead to the development of the paretic or tabetic syndrome during service.

King found general paresis to be, next to dementia precox, the most common mental disease in the army requiring institutional treatment. At the Ontario Military Hospital, Cobourg, where nervous and mental cases from the Canadian Expeditionary Forces are received, among 236 admissions of all types, 16 (6.8 per cent.) were paretics.

In other psychic disturbances likely to be encountered diagnosis rests primarily upon the mental symptom-complex. In paresis and tabes, however, three diagnostic syndromes—mental, neurological, serological—coexist and little difficulty should be experienced in a fairly early recognition of the disease.

EPILEPSY AND EPILEPTIFORM STATES. Despite all reasonable care in examining recruits, men with epileptic tendency will occasionally get on the strength. There are two points to emphasize:

1. There are other symptoms of epilepsy besides convulsions which may cause trouble. In cases with recurring dizzy spells, enuresis, fugue, fits of irritability or anger crises with violent acts, states of clouded consciousness and automatism with amnesia, the question of epilepsy should be considered.

2. Epileptiform seizures occur in many conditions. The chief ones are:

1. *Genuine Epilepsy.* Verified history of fits, usually from childhood; scars; character of seizures and postcritical stage; associated mental traits. Patients often report several years' free interval prior to enlistment, attacks recurring following exposure to shell fire.

2. *Post-traumatic Epilepsy.* History of old head injury followed by convulsions, with or without periods of intermission. In cases of fresh gunshot and shrapnel wounds of the skull, spasmodic motor discharges are extremely common.

3. *Hysteria.* Assuming reasonably thorough elimination of epileptics at examination of recruits, it is probable that the majority of unwounded men having convulsions will belong to the functional neurosis category. The nature and duration of attacks and independent neurotic characteristics should serve for diagnosis.

4. *Alcoholism.* Under the influence of chronic alcoholism a spasmophilic diathesis may become manifest in epileptiform convulsions. The history and cessation of fits following withdrawal of the drug will clear up these cases.

5. *Paresis.* Convulsions constitute one of the cardinal symptoms, occurring oftenest in the later course of the disease. They may appear early; occasionally, indeed, an unheralded epileptiform seizure opens the scene.

6. *Arteriosclerosis and Brain Syphilis.* Certain cases of so-called late epilepsy develop on the basis of these conditions.

7. *Brain tumor, meningitis* and other irritative lesions may give rise to epileptiform convulsions.

8. *Malingering.* Not only are the automatism and amnesia of epilepsy sometimes simulated, but even *grand mal.*

Primary Mental Defect. Pronounced defectives have no place in the service. Higher grade morons, however, are fairly numerous in every army and many have done their bit averagingly well. It cannot be said categorically that their entire elimination on the basis of mental tests is either feasible or desirable.

Slight degrees of feeble-mindedness are easily overlooked by medical boards dealing primarily with physical conditions, but it is well to remember that inattention, forgetfulness, failure to execute orders, erratic and unreliable conduct may sometimes be traceable to this cause. Intellective defect goes hand-in-hand with hypersuggestibility and is a suitable basis for the development of hallucinations and delusions associated with fear as well as of other neurotic or psychotic episodes.

Psychopathic Constitution. This broad category includes the most difficult individuals in the army to deal with. Strictly speaking, they belong neither with the feeble-minded, the insane nor the mentally sound, yet they dwell on the confines of all three and may partake of their characteristics. Grasset puts them in the somewhat indeterminate group of "semi-insane and semiresponsible."

Constitutional psychopaths are victims of unstable or inharmonious mental development. Frequently they exhibit antisocial or criminal tendencies, pathological lying, thieving, malingering, sex delinquencies While judgment defects in particular directions may be conspicuous, they are, in a general way, clear and rational. On the other hand,

they may possess special aptitudes, in spite of which their vacillating purpose prevents them from making a success of life; and with their usually exaggerated self-feeling they are likely to be habitually at odds with their environment. Their life history should sufficiently indicate that they will not make well-disciplined soldiers. From their ranks are recruited many of the malcontents, incorrigibles, grievance men and active trouble makers. Once the situation is recognized these men are better eliminated from the service with as little delay as possible.

NEUROTIC REACTIONS. *Etiology.* The psychotic and psychopathic states hitherto considered are largely independent of the military situation. Their primary causes are endogenic. Many would doubtless eventuate in the same way in civilian life. In other cases the morbid potential is accentuated under service conditions or furnishes the basis of pathological episodes which perhaps might not develop under more benign circumstances.

The neurosis, however, like all purposive conduct, is more specifically a *reaction to a given situation.* This reaction, expressing the combined effect of endogenic and exogenic factors, the war neurosis is further distinguished in the overwhelming preponderance of exogenic elements. It follows that many men will sooner or later show neurotic symptoms who might never have done so in civil life.

On the other hand, it must not be overlooked that the majority of cases develop in men *constitutionally predisposed.* In the rank and file are many men of primitive mental type, impulsive and suggestible, who are favorite victims of so-called shell shock. Not a few are high-grade defectives. They are betrayed by their naïve way of describing and explaining symptoms, particularly sensory disturbances, overlooking inconsistencies, giving variable accounts, innocently arriving at impossible conclusions.

It is generally true that the higher the type of mental organization with the implied self-discipline the less probable the occurrence of a lasting, severe, especially of a spectacular nervous disorder.

Interesting in this connection is the *difference between officers and men* in their reaction to war strain. The grosser forms of hysteria (mutism, functional paralyses, contractures, choreiform movements, tics), which are common in the ranks are extremely rare among officers.

The etiological importance of *trauma* in war neuroses has been greatly overemphasized. Its chief role may be looked for in the concussion syndrome following near-by detonation of high explosives and often accompanied by burial, the immediate effect of which is unconsciousness. This condition is discussed in another chapter. Its symptoms, like those following a blow on the head, are transitory. If enduring nervous invalidism supervenes, other causes must usually be sought than the direct effects of possible traumatism.

Psychogenic factors are generally conceded to be fundamental in the development and perpetuation of war neuroses. It is pertinent to refer here to the pathophilic tendency, which seems to be the inheritance of a large part of mankind. We recognize its painful development in certain individuals whose happiest recollections and favorite conversation topics are illnesses survived. Some men never outgrow the pride of childhood in crutch or sling, and to few is the derived

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sympathy unpleasant. A disability may also subserve other ends. It may vouchsafe to the schoolboy a day's freedom from irksome tasks. The fact is that certain disabilities may have a motive as well as or instead of a pathological basis.

In all these respects the war disability is a thing by itself. That sooner or later "blighty" comes to be the *summum bonum* of desire is not necessarily a sign of weakness, though not all men are willing to bide their time. Hence the needless, even deliberate exposures, and occasionally self-inflicted wounds. The motive of exemption from further service must always be kept in mind. Exemption once guaranteed, the pension motive may still further complicate the situation.

Now it is a striking fact that severe physical trauma and neurosis are, as a rule, mutually exclusive. This applies especially to injuries of brain or cord. Occasional exceptions indicate that neurotics sometimes get hurt as well as other men. On the other hand, the most spectacular and obstinate symptoms of neurosis are practically confined to unwounded men. Comparable facts are familiar in civil practice.

Furthermore, severe neuroses may follow not only concussion from high explosives but also other injuries and diseases, and may develop in men who have never left camp or suffered from any definite illness or accident.

The rarity of neuroses among prisoners of war, as well as among the civilian population of long and violently bombarded districts, is noteworthy. All three classes—civilians, prisoners and combatants—may have endured similar hardships and dangers, but with the first two the fixation motive of the neurosis is lacking. Prisoners taken after exposure to shell fire often present the primary concussion syndrome; but a neurotic after-phase seldom develops.

Finally, it has been shown that neurotic conditions are relatively more frequent in hospitals distant from the front than in the field hospitals themselves. The patient removed from the atmosphere of the trenches loses the mental tone which comes from mass effort and self-suppression. Moreover, civilian, and especially home, environment, is the best possible culture medium for psychogenic disorders. Russell noted among invalided British soldiers in England the frequency of hysterical paralyses and their rarity in France.

Types of War Neuroses. In the trenches the primordial emotion of fear appears to be universal and physiological, at least as an initial or episodic mental state. Hebephrenics are reported who have sat contented and unruffled under shell fire and dauntless hypomanics may plunge with relish into the most dangerous undertakings; but probably no normal man, and few others as well, escape altogether the bitter draught of anxiety and dread.

The eventual self-adjustment is simply the net expression of the soldier's temperamental and physical qualities under such stress as he is subjected to. Obviously neurotic reactions are of all gradations from the physiological fear state, which the self-disciplined soldier masters in the performance of duty, to the paralyzing disability which totally disqualifies for further military service.

The symptoms may practically all be classified under two headings —neurasthenia and hysteria.

War neurasthenia shows nothing essentially distinctive. Not infrequently the constitutional nature of the condition is apparent, and aggravation occurs early during service. On the other hand, nervous as well as physical exhaustion may be considered as the accompaniment of long-endured war strain, some degree of which any man may present if he "stands the gaff" long enough. It is also significant, as Wright[4] has pointed out, that the majority of cases are among the older men as opposed to hysteria, which prefers youth.

Burton-Fanning[5] draws attention to the "predominance of neurasthenia as a cause of going sick among newly recruited soldiers" (509 cases out of 1600 hospital admissions of camp men for all causes).

The complaints of neurasthenics generally are multiple, often vague and changeable. At the same time dominant symptoms are so commonly associated with particular organs that we may conveniently speak of the group of *somatoneuroses*. In endeavoring to exclude actual organic disturbance it may be necessary to give the invalid the benefit of the doubt; but one must guard against suggesting lesions. A fixed idea of disability is sometimes traceable to an ill-advised remark by the medical examiner.

It is to be borne in mind that trophic, vasomotor and glandular changes due to influence from the sympathetic and autonomic nervous system form part of the psychogenic symptom-complex.

Somatoneurotic reactions may be: (1) *Respiratory* (dyspnea, asthmatic tendency, phthisophobia); (2) *cardiac* (symptoms described as D. A. H.—Allbutt[6] suggests the term "ponopalmosis" as distinguished from myocardial inefficiency following infection and other mechanical defects—n. b., thyroid, tobacco); (3) *gastro-intestinal* (anomalous abdominal pains, constipation, sometimes nervous diarrhea, introspective dieting); (4) *excretory* (usually incontinence—history of enuresis in childhood(?) retention may follow concussion, hyperidrosis); (5) *musculo-articular* (pain and weakness reactions in general, constituting the commonest neurasthenic complaints; vague histories of "rheumatism," etc., to be received with due allowance and reservation).

Hysteria (popularly called "shell shock") develops, as a rule, abruptly and spectacularly, and oftenest in men young in years and young in service. Of 60 cases reported by Russell[7] the average time spent in France was two and eight-tenths months, not all of which was at the front; 9 cases were never in France.

In the immediate pathogenesis emotional factors (anticipatory fear, horror of carnage) are preëminent, as reflected in patients' dreams. The initial symptoms are usually of a paralytic sort (universal experience following terrifying stimuli: cf. "struck dumb," "paralyzed by fear," etc.) and associated with disturbance of the higher levels of consciousness (in actual concussion, partial or complete unconsciousness). In the gradual recovery from the state of hypo- or a-function (psychic, sensory and motor) one or more functions lag behind or

[4] Suggestions for a Further Classification of Cases of So-called Shell Shock, Canadian Med. Assn. Jour., July, 1917.

[5] Neurasthenia in Soldiers of the Home Forces, Lancet, June 16, 1917.

[6] British Med. Jour., August 4, 1917, p. 139.

[7] A Study of Certain Psychogenetic Conditions among Soldiers, Canadian Med. Assn. Jour., August, 1917.

remain in abeyance (*locus minoris resistentiæ*, hysterical dissociation, perseveration of specific defence reaction against original painful stimuli or their anticipated repetition). Habit, innate pathophilic tendencies and the motive of self-advantage assist in perpetuating the morbid condition.

Sensory Disorders. Hysterical blindness and deafness are usually sequent to concussion and unassociated with lesions of the sense organs. Concussion symptoms begin clearing within a few hours and even an occasional ruptured tympanum should heal in due time without impairment of hearing. Mott[8] states that only about 17 per cent. of the cases of deafness are due, even in part, to actual ear disease. According to Hurst,[9] as the concussion victim regains consciousness, vision generally returns quickly, hearing shortly afterward, while the patient may remain mute for a considerable time longer. Psychogenic blindness or deafness, however, unless energetically handled, may continue indefinitely. In concussion cases, with return of sensation, painful hyperacusis or photophobia may supervene.

Pain reactions of all kinds are regularly met with. Cutaneous anesthesia of familiar hysterical types is not uncommon, and often accompanies functional motor disorders. The preponderance of left hemianesthesia over right holds good in war as in peace, most soldiers, like most civilians, being right-handed.

Motor disorders of psychogenic origin include derangement of the speech mechanism (mutism, aphonia, dysarthria, dysphasia, stammering, even motor aphasia); tics (usually of head or face; general trembling (to the degree of making walking, even standing unsupported, difficult or impossible); tremor of extremities, worse under observation, even suggesting intention tremor; choreiform movements; myoclonus; epileptiform convulsions; rhythmic movements; local pareses, paralyses and contractures of all description.

Increased psychomotor irritability, with hypertonic and hyperkinetic symptoms, is by far the commonest disturbance of motility. Even in convalescents of many months a sudden, unexpected auditory or touch stimulus may produce a violent motor discharge with incoordinated spasmodic movements.

A special type of functional contracture is trench spine, the lineal descendant of railway spine. It varies from moderate rigidity of the back muscles, with complaint of pain to a maintained right-angle kyphosis ("camptocormie" of French writers),[10] the invalid walking like a carpenter's square on end. Various other antipain postures occur, as well as perseveration limps, even conspicuous apparent shortening of one leg through tilting of the pelvis.

Psychic Disturbances. In concussion cases a stuporous state may persist for several days, furnishing the cue for continuing individual symptoms (*e. g.*, amnesia) and episodic conditions such as dream-waking, hallucinations (sounds of battle), automatism.

Concussion amnesia is a matter of hours. Psychogenic amnesia may cover a much longer period both anterograde and retrograde.

[8] Mental Hygiene and Shell Shock during and after the War, British Med. Jour., July 14, 1917.

[9] Medical Diseases of the War, Arnold, London, 1917, p. 9.

[10] Souques and Rosanoff-Saloff: Rev. Neurol., November and December, 1915

Oppenheim,[11] comparing cases of trephine amnesia with those following shell shock without external injury, found the latter much less likely to retain memories of their trade or profession than the former.

One man returned from the front maintained total inability to recall anything in his past life, including his marriage, the appearance of members of his family, the streets of his native town. He dated contemporary recollection from a shock received when in a fit of agitation he left his bed and dashing through the ward collided with a brick wall.

Loss of memory is a favorite complaint of war neurotics, but coöperation is not always of the sort to make memory tests of value.

Many patients display a degree of mental sluggishness and lack of initiative with unapparent will to recover. They are mildly bored as they recount the various kinds of treatment their infirmity has successfully withstood. In others the dominant characteristic is a childish timorousness, with emotional instability, tearfulness and painful loss of self-confidence. Soldiers, like horses, may become broken-spirited.

Not infrequently there is observed in the psychic sphere a condition suggestively analogous to postconcussion asthenopia due to defective innervation of the ciliary muscles. There is definite retardation, varying with the difficulty or affective content of the response, and particularly an insufficient fixation and maintenance of attention, the patient tending to lapse into silence, with apparent diffusion of attention. Such an individual placed in new surroundings does not readily assimilate the usual data of orientation and easily loses his way.

In connection with the war neuroses it is to be noted that transitory conditions suggestive of severe psychoses are much commoner than in civilian practice. Under field conditions, for example, a permanent schizophrenic process may first come to light, partially masked perhaps by reactive neurotic symptoms. On the other hand, a soldier with mild schizophrenic traits may under war stress or during the course of a neurosis pass through an acute psychotic episode which clears up rapidly and which might not have occurred in ordinary life.

In dealing with the war neuroses in general one repeatedly encounters the difficulty of avoiding the inference, however slight, of some element of deception. But this feature should always be first a matter of clinical rather than ethical judgment. Major Russell,[12] on the basis of his exceptional experience at Granville Special Hospital, divides all nervous disturbances without corresponding signs of organic disease into two categories: (*a*) hysteria; (*b*) malingering. This classification involves a dilemma both horns of which may be unpleasantly pointed. Russell steers safely between by promptly discarding his classification and applying the term "psychogenetic condition" to everything in both groups. This "does away with the necessity of making a distinction between those cases which may be suspected of voluntary simulation of symptoms and those others which are genuine."

Treatment. Cases of neurosis should be turned over with as little delay as possible to psychiatric units or special hospitals. Their successful management depends more upon the personality, acumen

[11] Traumatic Amnesia, Prog. méd., Paris, June 2, 1917. [12] Loc. cit.

and assurance of the medical officer than upon any pet method he may invent or follow. The great variety of measures in vogue indicates that the war neuroses do not differ in this respect from those of everyday life. Only certain guiding principles need here be referred to.

Treatment should be started promptly and carried out rapidly and determinedly. There should be as little relaxation of military discipline as possible. Men do better, as a rule, in the atmosphere of the war zone than when far removed, especially to their home districts. Visits and communications from relatives and friends are often contra-indicated, and it is questionable policy to allow a neurotic invalid home on pass before or during treatment.[13]

For certain shock symptoms a counter-shock may be all that is required. One "postconcussion" mute suddenly regained the power of speech when the stretcher-bearers accidently dropped him. Victims of painful stammering sometimes show remarkable ease and fluency of utterance when anger-provoking stimuli lead to an outburst of profanity.

Intensive, even heroic, procedures are best adapted to the more spectacular motor and sensory disorders;[14] although in some instances the mere knowledge, on the part of the patient that a certain object upon which he has set his heart can only be attained after a perverted or suspended function has returned to normal, may bring the desired result.

Treatment of the neuroses includes not only active measures to overcome disabling symptoms, together with tonic, nutritional, rest and sedative agencies, electro-hydro-therapeusis, etc., as indicated in individual cases, but also a certain amount of psychomotor reëducation. A new mental attitude and a new way of self-management should be aimed at to ensure the after-condition of the nervous invalid. The end of the war will automatically bring many self-adjustments and cures, but an expectant method based on this contingency is hardly justified.

Congenital and systematic occupation should be given foremost place in any scheme of treatment. Idleness and moving about from hospital to hospital should be reduced to the uttermost minimum. Charcot said: "Il ne faut pas laisser flâner les contractures hystériques." This golden rule applies to all war neurotics. The best preventive for the terrifying dreams which are so common is, as Russell points out, regular and interesting work.

Prophylaxis begins with the selection of recruits. After work in camp a period of training behind the lines is the method best calculated to reduce the danger of nervous break-down. It has been suggested that the depressing after-effects of alcohol issued to men about to go into action may heighten the susceptibility of the nervous system to neurotic reactions. The possibility is worth considering.

[13] Every rule has its exception. A speechless soldier, out on pass, got drunk with some friends and in the cheeriness of the occasion recovered his voice.

[14] Sir William Osler calls the precipitate and successful methods in use in the Granville Hospital "therapeutic jugulation." As might be expected, Germany was not slow in devising heroic means of treatment. The "Ueberrumpelung" method with severe and painful electric stimuli has resulted in cures, and has also been followed by deaths.

Finally, it would seem highly desirable to incorporate in the system of training a certain amount of information concerning war neuroses and to teach mental hygiene as well as physical. Morton Prince[15] has already put this suggestion into tangible form.

There has come into being at the front—nor is it confined to the front, nor yet to the army—a shell-shock tradition which should be combated by all available means. This tradition implies an actual physical injury to the nervous system as cause and some sort of severe organic disability as the result. Moreover, it makes shell shock the disease of the hour, so to speak—a disease not only new, but by association preëminently distinguished. There might be fewer and shorter cases if Prince's term "shell funk" were officially substituted for the more impressive and euphonious "shell shock."

ORGANIZATION AND ACTIVITIES OF THE AMERICAN RED CROSS BUREAU OF SANITARY SERVICE.

JANUARY 10, 1918.

TO ALL DIVISION MANAGERS, AMERICAN RED CROSS:

In accordance with an agreement reached at the meeting of the American Red Cross Division Managers, held at Washington, D. C., January 8 and 9, 1918, I transmit herewith a synopsis of the activities of the Bureau of Sanitary Service, American Red Cross.

(Signed) J. CLARK,
Surgeon, U. S. Public Health Service,
Acting Director, Red Cross, Bureau of Sanitary Service.

On June 14, 1917, a "Memorandum Relative to Coöperation of the Red Cross with the United States Public Health Service in Sanitary Matters Having an Effect on the Prosecution of the War" was presented to the Medical Advisory Committee of the War Council and approved:

The Bureau of Sanitary Service, to operate under the Department of Military Relief, was established by resolution of the War Council of the American Red Cross July 17, 1917, and a provisional appropriation of $10,000 was authorized for its organization and development.

The primary object of the American Red Cross in establishing the Bureau of Sanitary Service was for the purpose of giving aid to Federal, State and local authorities in securing and maintaining effective sanitary control in the civil districts surrounding or adjacent to National Army Cantonments, National Guard Camps and Naval Bases.

The control of sanitary matters in the civil districts adjacent to the various military areas is a function delegated by legislative enactment to State health authorities, and through them to local health organizations. State and local funds for such purposes in the past have been extremely limited, a condition that can be remedied only by legislative action, a procedure requiring a considerable period of time to accomplish.

[15] Jour. Am. Med. Assn., September 1, 1917.

The relatively rapid mobilization of troops in certain areas accompanied by almost equally sudden and great increase in the civilian population in the vicinity of the selected camp sites, created new conditions and increased the necessity for more rigid sanitary control in extra-cantonment areas, an emergency that would tax the resources of the best health organization to meet. The local health authorities were therefore forced in nearly every instance to call on State or Federal authorities for assistance.

The United States Public Health Service, by law, is empowered to coöperate with State and local authorities in the prevention and control of communicable diseases, and had already taken steps to assist these authorities. In view of the limited personnel and available funds and, furthermore, because of the necessity for speedy action in affecting the sanitary control of extra-cantonment areas, it seemed warranted for the American Red Cross, supported largely by contributions from the whole people, to coöperate with Federal, State and local authorities in this national emergency. The Bureau of Sanitary Service, therefore, was established and Surgeon W. H. Frost was detailed by the Surgeon-General of the United States Public Health Service to act as the director. Unfortunately, Surgeon Frost was forced to relinquish this position by reason of ill health, and resigned the directorship on November 6, 1917.

Organization of Sanitary Units. Under a broad plan of coöperation between Federal, State and local health authorities and the American Red Cross, the Bureau of Sanitary Service is furnishing personnel and funds to complete the sanitary organizations in extra-cantonment areas, supplementing the resources of the local communities, the State and the Public Health Service until some provision can be made for supporting these organizations without the aid of the Red Cross. Assistance is given by the Red Cross only upon request from local or State authorities on recommendation of the Surgeon-General of the the Public Health Service, based upon a preliminary survey in the vicinity of each cantonment to determine whether the conditions in the district establish the need for aid.

The Red Cross furnishes supplementary assistance by assigning to the district a group of trained assistants, bacteriologists, sanitary inspectors, Red Cross public health nurses, with an appropriation sufficient to provide the necessary equipment, transportation and maintenance, which group is organized into a Red Cross Sanitary Unit.

The coöperative health organizations thus established represent the combined resources of Federal, State and local authorities supplemented by auxiliary assistance from the Red Cross. The administration of its activities is placed under the direction of the public health officer who acts also as director of the Red Cross Sanitary Unit. To him State authorities delegate the power and authority of deputy State health officer and all activities are coördinated and centralized under his supervision.

An Officer of the Public Health Service, or one recommended by that service, is appointed director of the unit and is immediately responsible for the work.

Associated with the director of the unit is a fiscal officer, usually a

local business man appointed on the recommendation of the local Red Cross Chapter, who is the fiscal agent responsible for the funds appropriated.

Places to which sanitary units have already been assigned:

Unit No.	1. Columbia, S. C.	Unit No.	14. Macon, Ga.
	2. Little Rock, Ark.		15. Manhattan, Kan.
	3. Louisville, Ky.		16. Chattanooga, Tenn.
	4. Des Moines, Iowa		17. Spartanburg, S. C.
	5. Leavenworth, Kan.		18. American Lake, Wash.
	6. Hattiesburg, Miss.		19. Montgomery, Ala.
	7. Petersburg, Va.		20. Charlotte, N. C.
	8. Anniston, Ala.		21. Waco, Texas
	9. Newport News, Va.		22. Alexandria, La.
	10. Ayer, Mass.		23. Fort Worth, Texas
	11. Atlanta, Ga.		24. Wrightstown, N. J.
	12. Chillicothe, Ohio		25. Augusta, Ga.
	13. Greenville, S. C.		26. San Antonio, Texas

The personnel of the 26 units is as follows:

Directors (services free)	26
Assistant directors (service free)	17
Fiscal officers (services free)	26
Assistant fiscal officers (services free)	20
Bacteriologists (paid employees)	6
Minor employees (paid employees)	5
Sanitary inspectors (paid employees)	52
Red Cross Nurses (paid employees)	54
	206

Transportation. Under the authority voted by the War Council, August 24, 1917, Ford automobiles have been allotted in requisite number, usually two, to the respective sanitary units for use by inspectors and nurses in the territory adjacent to military encampments.

The Work of the Sanitary Units. The work of these local organizations in which the Red Cross unit coöperates is also varied to meet conditions, but in general it includes the following: A public health laboratory, in charge of a competent bacteriologist established for bacteriological examinations of water and milk supplies and to assist in the diagnosis of infectious diseases. A house-to-house inspection of sanitary conditions is made in the whole district. Insanitary conditions must be remedied by the property owners, after which regular inspections must be made at frequent intervals. Systematic inspection is established for dairies, milk depots, restaurants, markets and all places where food and refreshments are prepared or sold. Special effort is made to have all cases of infectious diseases promptly reported and to have each case, as reported, visited by an inspector or a public health nurse to instruct the attendants in necessary prophylactic measures and to see that they are carried out.

Prevention of Malaria. Special work is necessary in most Southern districts for the prevention of malaria. This requires the eradication of malaria-bearing mosquitoes in a fairly wide zone surrounding the cantonment, and also the adjacent centers of population which are visited frequently by men from the encampment. The work of

mosquito eradication is not confined to communities in which malaria is highly prevalent. It is being carried out in all the districts where malaria mosquitoes are found in considerable numbers, and when there is a possibility that malaria might become more prevalent with the increase of population due to the establishment of the camp.

The same principle applies to other sanitary work, and the fact that active sanitary measures are undertaken in the vicinity of a camp does not necessarily mean that previous sanitary conditions in that district were especially bad.

Isolation Hospitals. The question of isolation hospitals for the segregation and treatment of communicable diseases has been given consideration. The War Council appropriated on August 14, 1917, $1000 to be used in the study of this project. Dr. Charles V. Chapin, Superintendent of Health of Providence, R. I., a member of the Medical Advisory Board and a prominent sanitarian, upon request, visited several cantonment areas. In his report he questioned the advisability of the expenditures necessary for the purchase of portable hospital units. He concluded that the chief requirement would be a good organization for the control of contagious diseases in each area.

The effective control of ordinary communicable diseases in extra-cantonment areas seems, largely, to depend upon the efficiency of the coöperative health machinery established.

Auxiliary Nursing Service. Steps have also been taken to inaugurate an auxiliary nursing personnel to be available in case of epidemics or other emergency.

Mobile Laboratory Cars. Four mobile laboratory cars authorized by the War Council August 14, 1917, are now in commission. Wooden Pullman cars have been converted for this purpose and all necessary apparatus has been installed in two of these cars, including sleeping quarters for a maximum personnel of ten workers and assistants.

These cars, when in active service, will be operated by volunteer professional men, skilled in the diagnosis and treatment of diseases. Ordinarily a professional staff of about five men will accompany each car when in service. In addition, provision has been made for the services of cooks, technicians and a fiscal officer.

Upon a written request from the Surgeon-Generals of the Army, Navy or Public Health Service the nearest available car with personnel and equipment will be dispatched to a designated point with instructions to the director to confer with the proper local authorities. They are based under designation at the following places:

"Lister," Director Dr. L. Hektoen, Chicago, Ill.
"Metchnikoff," Director Dr. Fred P. Gay, San Francisco, Cal.
"Pasteur," Director Dr. James W. Jobling, Nashville, Tenn.
"Reed," Surgeon-General, U. S. Army, Washington, D. C.

The "Pasteur" was detailed December 5, 1917, to assist the personnel of the base hospital at Camp Bowie, Fort Worth, Texas, in pneumonia work and has just been requested for service at Camp Beauregard, Alexandria, La., in meningitis work. The car "Lister" was similarly detailed December 27, 1917, to Camp Doniphan, Fort Sill, Oklahoma. All of these details were made on request of the Surgeon-General of the United States Army. On request, with the approval

of the Director-General of Military Relief, January 3, 1918, the car "Reed" has been placed in custody of the Surgeon-General of the United States Army, to be operated and manned by a staff from the Medical Corps of the United States Army.

Venereal Disease Control. Under the authority of resolution by the War Council, November 14, 1917, making appropriation to be expended by the Director of the Bureau of Sanitary Service for coöperation with the Army and Navy, Public Health Service and with State and local health authorities in the control of dangerous communicable diseases, nine clinics for the treatment of "carriers" of venereal infection have been established and funds set aside for their maintenance for the protection of military forces in extra-military areas. It is proposed to establish other clinics as rapidly as practicable, in accordance with the following plan:

1. Inasmuch as the venereal diseases are only a part of the general problem of communicable diseases for the control of which the United States Public Health Service has assigned officers as directors of sanitation in each of the extra-contonment areas, and has already taken steps for the treatment of "carriers" and the hospitalization of certain cases, it is proposed that the local administration of whatever measures are instituted for the control of these diseases shall be by the directors of sanitation in the areas in question.

2. For the purpose of selecting the best measures for the control of venereal diseases, there shall be established, at first, dispensaries or clinics for such diseases in only a few selected areas.

3. The function of such a clinic shall be (*a*) treating "carriers" of venereal infection; (*b*) hospitalization of selected cases wherever practicable; (*c*) utilizing and instructing local practitioners in the control of venereal diseases; (*d*) distributing, free of cost, to local practitioners, salvarsan and other venereal remedies under prescribed regulations; (*e*) making free bacteriological examinations, serological tests and other laboratory investigations of venereal diseases at the request of local practitioners and certain administrative officers; (*f*) advising persons who may desire confidential information, with respect to possible infection of themselves, proper treatment and related subjects.

4. It is proposed that the existing sanitary units in the selected areas shall be supplemented by the following personnel:

One specialist in venereal diseases.
One or two probation officers.
One social worker.
One clinic nurse (male).
One clinic and follow-up nurse (female).
One to four policewomen.

5. It is proposed that the United States Public Health Service provide and pay the salary of a general specialist for each established clinic wherever the services of such a specialist shall be required.

6. It is proposed that the United States Army, through the Commission of Training Camp Activities, provide the necessary probation officers to study and act upon individual cases, secure the necessary attendance at clinics and for such other additional duties as may arise in connection with persons convicted in the local courts who may be suffering from venereal infection.

7. It is proposed that the United States Army will continue the services of a social worker in such extra-cantonment areas for educational and other purposes.

8. It is proposed that the American Red Cross shall furnish one male nurse for clinic purposes and one female nurse for combined duty in the clinic and follow-up work.

9. It is proposed that the necessary surgical appliance and drugs shall be provided by the American Red Cross in the amounts needed.

10. It is proposed that the American Red Cross shall furnish the necessary transportation for follow-up work and other control measures in connection with these clinics.

11. It is proposed that the providing of proper office space shall be requested of the local authorities. In the event of the inability of the local authorities to provide such quarters, the same shall be provided from appropriations of the American Red Cross.

12. It is proposed that a requisite number of policewomen shall be furnished by the local authorities to properly enforce antiprostitution ordinance.

13. It is recommended that clinics so established shall be continued for a provisional period of six months, and longer should the necessity of the work warrant such procedure.

14. The United States Public Health Service is prepared to make the necessary bacteriological examination, serological tests and other laboratory investigations.

15. It is proposed that pamphlets on the control of the venereal diseases and other educational material shall be requested of the American Social Hygiene Association for free distribution.

Public Health Nursing. A supervising public health nurse recommended by the Bureau of Nursing Service has been appointed by the Public Health Service. This nurse will assist the extra-military areas where sanitary organizations have been established and also study public-health nursing requirements. This supervision, direction and development of nursing activities will be extended to all nurses employed under the central health organization.

Inspection of Red Cross Sanitary Units. The Surgeon-General of the Public Health Service has detailed an officer of that service to visit and inspect all Red Cross Sanitary Units. This officer will be expected to remain at each unit a sufficient length of time to familiarize himself with the operations of the unit, and upon the completion of his investigations to submit a written report with such recommendations as seem necessary for increasing the working efficiency of the unit.

REVIEWS

DISEASES OF THE NERVOUS SYSTEM. By SMITH ELY JELLIFFE, M.D., Ph.D., and WILLIAM A. WHITE, M.D. Second edition, revised, rewritten and enlarged. Pp. 938; 124 engravings and 11 plates. Philadelphia and New York: Lea & Febiger, 1917.

THIS is the second edition, the first having been reviewed in this JOURNAL some years ago. The present edition has been considerably enlarged, there being added a general introduction setting forth the purpose of the volume. The chapters on the vegetative nervous system and the endocrinopathies have been entirely rewritten. Advantage has been taken of the war literature, and such additions can be found in the chapters on injuries of the peripheral nerves and of the brain. Otherwise the book remains the same. There is no question that the organic part of this work is excellent. The authors know what they are talking about and their method of presentation is direct and to the point. Their presentation of organic anatomy and physiology and the symptoms of organic nervous diseases is excellent, although they have not taken advantage of the recent literature on cerebellar disease, and the whole discussion of cerebellar symptomatology is old. The presentation of the vegetative nervous system and of the functions of the internal glands is the best that can be found in any text-book on nervous diseases; in fact, there is no text-book on the nervous system which covers this point so fully and as well as this. The illustrations are very good and are well chosen. Most of them are from the French, after Dejerine. They are perhaps the best in existence, and the authors have done well in choosing them.

Both authors are well known as disciples of Freud, and have popularized Freud's teachings perhaps more than anyone else in this country. Their conception of the neuroses is entirely Freudian, and they have no patience with the older view-point. In fact, they do not mention it. The large amount of literature on shell shock is not discussed, excepting that shell shock is mentioned in the discussion of traumatic neuroses, and it is noted that shell shock develops in those with a psychopathic constitution. The presumption is that the authors regard shell shock from the Freudian stand-point. The psychiatric portion of the work is excellent, and of course is from the Freudian view-point. T. H. W.

MODERN DIETETICS. By LULA GRAVES, Dietitian, Lakeside Hospital, Cleveland. Pp. 202. St. Louis: The Modern Hospital Publishing Company, 1917.

THIS monograph, representing a collection of eight papers on "Feeding the Hospital," recently published in the *Modern Hospital*, has very justly received much popularity.

It is especially valuable to dietitians, hospital officials, physicians, medical students and nurses—as well as to institutional, government and military officials.

Good foodstuffs, intelligently selected, properly stored, prepared and served by experienced persons are economic essentials.

Food composition and the body's need and use of food is carefully explained. Each class of food is discussed as to its characteristic composition and food value, and its place in the dietary.

Special diet for use in disease, in various different institutions and in different classes of people are outlined, with complete recipes for both institution and home use. The composition and caloric value of each recipe is given and the Atwater tables are attached.

Especially interesting and most complete are the suggestions as to training-school work in dietetics, making the book a valuable one to domestic science classes.

The book is well written and of more value to institutions than to private homes. J. D.

A MANUAL OF ANATOMY. By HENRY ERDMANN RADASCH, M.Sc., M.D., Assistant Professor of Histology and Embryology in the Jefferson Medical College, Philadelphia. Philadelphia: W. B. Saunders Company, 1917.

THE desirableness of placing in the hands of the preparatory or the first-year medical student a reliable volume of modest size, anticipating the study of the elaborate text-books of anatomy, is widely recognized. The preparation of a manual meeting these requirements was the task that Dr. Radasch has undertaken, and very acceptably completed, since within the 473 pages of the book is contained an up-to-date account of all the more important structures of the human body.

The author has been fortunate in being able to utilize the admirable plates of the well-known *Atlas* of Sobotta-McMurrich as the illustrations for his book, either as direct reproductions, or as the basis of simplified line drawings. In addition a number of original sketches and diagrams, as well as photographs, are included in the 329 figures elucidating the text.

In adopting the BNA names the author has decided wisely, since the use and demand for this terminology is steadily increasing.

The misnomer, "false," as applied to certain vertebræ and ribs should be eliminated, conveying to the student, as it does, erroneous notions as to morphological values. In places the names appearing in the text do not agree with those of the legends of the figures. Thus, although the illustrations of the hip bone are labeled innominate bone, no mention of the term occurs in the text—a discrepancy making for the confusion of the student.

The series of excellent diagrammatic drawings, showing the course of the lymph paths and the position of the nodes, is a valuable feature of the book. The section devoted to the central nervous system is adequate and contains many instructive diagrams. The retention of the now obsolete name corpora albicantia for the corpora mammillaria is odd in a book avowedly adopting the new terminology. Labeling (Fig. 279) the gyrus cinguli as the "cingulum," one of the association tracts, is misleading. But these are minor shortcomings that may easily be corrected in later editions; on the whole, Dr. Radasch has surely earned the gratitude of the group of students for whom the book was written.

G. A. P.

COLLECTED PAPERS OF THE MAYO CLINIC, ROCHESTER, MINN. Edited by MRS. M. H. MELLISH. Volume VIII, 1916. Pp. 1014; 411 illustrations. Philadelphia and London: W. B. Saunders Company, 1917.

THIS large volume, containing publications by the staff of the Mayo Clinic during 1916, is made up of 93 separate articles from 42 authors, and it is explained in the foreword that several of these are presented only in abstract and that others are held over for subsequent publication. The greatest number of papers are from the pen of Dr. Charles H. Mayo, who contributed ten, no other member of the staff having produced during that year more than five. The average of more than two papers for each writer is an enviable record, and cannot be equalled by many teaching or research institutions.

While most of the publications deal with practical surgical problems, there are many that emanate from the laboratories, and that have a bearing upon medical as well as surgical conditions. The contents are arranged according to systems under the following headings: alimentary canal, urogenital organs, ductless glands, blood, and head, trunk, and extremities. There is another group of articles dealing with technic, in which are described a water-cooled retractor for use in the mouth, staining methods for use in the study of pathological lesions in sympathetic ganglia, and a very clever machine for shaking blood-mixing pipets. The final section contains general matter, such as the element of error in abdominal

diagnosis, an appreciation of the roentgen rays, hospital problems of gonorrhea and syphilis, the value of public health service, the status of the graduate degree in medicine, and an able appreciation by Dr. William J. Mayo of Dr. John B. Murphy.

The illustrations deserve special mention, being in every instance well done; this is in part attributable to the excellent grade of paper employed by the publishers, but particularly to the care with which the specimens, apparatus, models, etc., have been prepared and photographed. An index of contributors, a bibliographical index, and an index of subjects, the latter covering 19 pages, concludes this valuable 1916 contribution from the Mayo Clinic. T. G. M.

ERFAHRUNGEN ÜBER DIAGNOSTIK UND KLINIK DER HERZKLAPPENFEHLER. By PROFESSOR S. E. HENSCHEN, chem. Direktor der medizinischen Universitätsklinik in Upsala und der medizinischen Klinik in Stockholm. Pp. 355. Berlin: Julius Springer.

IN this exhaustive study of 300 cases of valvular heart disease, the author takes up the subject from almost every point of view. The case protocols are given in considerable detail and the individual valve lesions are grouped together. Considerable space is devoted to certain combinations of valvular lesions which are clinically seldom seen and are of little clinical importance. In the latter part of the volume there is a lengthy discussion of pulse curves with many radial pulse tracings. These are unaccompanied by jugular tracings and so must depend in many instances for their value on the character of the curves, a point of doubtful value. No electrocardiographic curves are given. On the whole the work is lengthy, undigested, and presents nothing new. O. H. P. P.

A CHEMICAL SIGN OF LIFE. By SHIRO TASHIRO. Pp. 142. Chicago: The University of Chicago Press, 1917.

THIS is a very interesting little book. The preface, part of which is quoted, gives an adequate idea of the purposes of this work:

"The present work is an attempt to apply facts discovered during the study of the physiology of nerves to living processes in general. That mechanism characteristic of all living matter which enables it to respond to the external world is best developed in the nervous system. This mechanism may be called the most characteristic thing in life. The chemical accompaniment, or basis, of this mechanism, discovered by the author in nerve fibers, he has hoped

to show exists also in all forms of living matter, both of plants and of animals. It gives a chemical method of distinguishing living from dead tissue, and of measuring the quantity of life.

"This book therefore contains somewhat in detail all the essential facts which he with his students has discovered from studies of the chemical changes in nerves accompanying functional change. In the presentation of this work, however, many important references and discussions have been omitted in order that the reader may not lose the main trend of the argument. The facts themselves are nevertheless given in the form of accurate numerical data so that the book may be useful also to the specialist whose interest lies more directly in the general physiology of the nervous system."

According to the author there are two signs or tests which all living things show and which are an index of life. One of these is an electrical disturbance, discovered one hundred years ago, and the other a chemical sign, just discovered and discussed in this book. According to the author's experiments it has been shown that the living nerve fiber is no exception to the rule that all living matter undergoes chemical changes. This is shown by means of a biometer invented by the writer. By the use of this apparatus the author showed that the living nerve fiber normally gives up a certain amount of carbon dioxide and that when it is excited the amount of carbon dioxide is increased. Dead or anesthetized nerves show no such change. This discovery is applied to the practical question of finding out whether or not a seed is dead or alive. This work is very interesting and is full of suggestions for the future. T. H. W.

THE PRINCIPLES OF GYNECOLOGY. By W. BLAIR BELL, B.S., M.D. (Lond.), Gynecological Surgeon, Royal Infirmary, Liverpool. Second edition. Pp. 523; 363 illustrations and 6 colored plates. New York: William Wood & Co., 1917.

SEVEN years have elapsed since the first edition of this book was presented to the medical profession, but aside from minor alterations in the text and some improved illustrations the book remains much the same. The peculiar arrangement of the subject matter under pathological headings rather than the classification of the various disease entities according to the organs involved, greatly dismembers the continuity of many of the subjects and detracts from the value of the work as a working guide for the student.

The description of the operative procedures that are employed in gynecological practice is very brief, as perhaps it should be in a work of this kind, while on the other hand, considerable attention is paid to detail in the description of minor gynecological practises, as, for example, the pessary treatment of retroversion of the uterus.

References to the work of others and conflicting opinions of authoritative gynecologists are purposely excluded since the author merely desires to present his own observations and experiences. This feature, together with the inclusion of chapters on venereal diseases, obstetric problems and electrotherapy in gynecology should make the book especially interesting to the general practitioner.

F. B. B.

THREE CONTRIBUTIONS TO THE THEORY OF SEX. By PROF. SIGMUND FREUD, Vienna. Authorized Translation by A. A. BRILL, M.D. Nervous and Mental Disease Monograph Series No. 7. Pp. 116. New York: Nervous and Mental Disease Publishing Co.

THIS is the second revised and enlarged edition of this work, which appeared some years ago. The present edition has an introductory chapter by James J. Putnam. According to him the keynote of psychoanalysis is in the understanding of the sex instinct and its development. This work, of which this is an excellent translation, presents the essential views of Freud on this subject. No understanding of psychoanalysis is possible unless one understands the theory of sex, and there is no better presentation in the English language than this.

T. H. W.

DISEASES OF WOMEN. By HARRY STURGEON CROSSEN, M.D., F.A.C.S., Associate in Gynecology, Washington University Medical School. Fourth edition, revised and enlarged. Pp. 1125; 800 illustrations. St. Louis: C. V. Mosby Company, 1917.

THE appearance of a fourth edition of this book within ten years from the date of the initial edition is, of itself, sufficient to prove that it has met the requirements of the medical profession. It would hardly be fair to the author, however, if the merits of the book were passed by with such a simple statement of fact. The character and scope of this work are such that it has always been considered among the best books of its kind, and the present edition, enlarged and revised, has been brought right up to the minute as evidenced by the careful consideration of such subjects as the radium treatment of inoperable cancer of the uterus and fibroid tumors.

A large part of the credit for the present revision is due to the painstaking care of Dr. Hugo Ehrenfest, who relieved Dr. Crossen of this difficult task when the latter was called to military duty, and especially must mention be made and due credit given to Dr. Ehrenfest for the excellent chapter which treats of the relation of the

ductless glands to the female generative organs. No present-day volume of this character can be considered complete without a thorough presentation of the present status of the endocrine organs and organotherapy, and in this field, as indeed throughout the entire book, the author has left out nothing of importance.

Owing to the fact that little material is deleted with the appearance of successive editions, the present volume has reached quite a large size and is more profusely illustrated than any of its predecessors. The illustrations consist chiefly of semidiagrammatic drawings, photomicrographs and photographs of patients and specimens, all well selected. There should be no hesitancy in venturing the opinion that this work will continue to enjoy the popularity that it has long since attained. F. B. B.

A Manual of Nervous Diseases. By Irving J. Spear, M.D. Pp. 660; 172 illustrations. Philadelphia and London: W. B. Saunders Company.

This volume is intended for the student and for the general practitioner. It is a little larger than a compend, containing quite fullsome descriptions of the anatomy and physiology of the nervous system and of the different organic and functional nervous conditions. There is nothing original about the book, it following along the old and well-known lines. It has apparently been carefully compiled, but it can hardly be said to be up to date. For example, according to the author the motor centers are not only in the precentral convolutions but in the anterior portion of the postcentral, whereas for many years everyone has agreed that they are entirely located in the precentral convolution. For the cerebellum no attempt is made to give modern localization, and the author states that disturbance in the middle lobe may cause forced movements, tremors, and cataleptic attitudes, and that disease of the cerebellum may bring about incoördination, abnormalities of movements, ataxia, vertigo, speech disturbance, nystagmus, adiadochochinesis, disturbances of equilibrium, etc. In other words, a repetition of all of the symptoms that the cerebellum has been accused of for years, whereas it can all be very well summed up in one word, "disturbances of asynergy." In discussing the symptoms of locomotor ataxia the author states that the tendo Achilles reflex is rarely absent and that the reflexes of the upper extremities are generally preserved and are often increased; whereas everyone knows that the tendo Achilles-jerk is just as frequently absent as the knee-jerk, and that it is only in rare instances that the upper arm reflexes are preserved. In discussing tumors of the brain, he states that gliomatous tumors are third in frequency, whereas all path-

ologists state that it is the most common. These are only instances of inaccuracies which are found throughout the book. Such inaccuracies have no business to occur in any modern book on the nervous system. T. H. W.

INFECTED WOUNDS. By A. CARREL and G. DEHELLY Pp. 238; 97 illustrations. New York: Paul B. Hoeber, 1917.

THIS little treatise has been translated by Herbert Child, and has an introduction by Sir Anthony A. Bowlby, Surgeon-General to the British Armies in France, whose sanction it carriers. The book takes up the treatment of wounds in every phase, and tries to show that antiseptics, especially the chlorine group, can be relied upon to do almost phenomenal work. The principles of the technic of the Carrel-Dakin treatment are clearly elaborated, the technic of the making of Dakin's solution, the sterilization of wounds, mechanical, chemical and surgical sterilization, the bacteriological examination and the final closure of the wound are all described in the most extensive manner.

The book is remarkable for the detail and the minutiæ of its varied descriptions.

The reader must, however, bear in mind that the primary treatment demanded by wounds is good surgery and its associated clinical care. These, coupled with antiseptics well applied and intelligently used will usually give good results.

The book rather emphasizes the antiseptic treatment and its value, more than the surgical management of wounds.

The results claimed are almost phenomenal. E. L. E.

THE HISTORY OF THE PSYCHO-ANALYTIC MOVEMENT. By PROF. DR. SIGMUND FREUD, Vienna. Nervous and Mental Disease Monograph Series No. 25. Authorized English Translation by A. A. BRILL. Pp. 58. New York: Nervous and Mental Disease Publishing Company, 1917.

THIS is another of the Nervous and Mental Disease monographs, and is a very interesting contribution by Freud himself on the history of the psycho-analytic movement. The translation is by A. A. Brill. It contains Freud's own history of the movement, and as such is interesting from the psycho-analytic stand-point. The last part of the paper is a protest, or rather a discussion, of the modifications of psycho-analysis by Adler and Jung. Freud concludes that Jung's new theory, which he desires to substitute for psycho-analysis, emphasizes an abandonment of analysis and a cessation from it. T. H. W.

PROGRESS
OF
MEDICAL SCIENCE

SURGERY

UNDER THE CHARGE OF

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Course and Treatment of Joint Suppurations; the Technic of Making the Drainage Opening.—PAYR (*Deutsch. Ztschr. f. Chir.*, cxxxix, 1) discusses this subject from the stand-point of his military service and lays particular stress on the various routes for opening the different joints for drainage, using numerous excellent illustrations for these operations. The following methods of treatment were employed: Tincture of iodin, Lugol's solution, or phenol-camphor, was injected into the joint. The last substance is to be employed only when there is not a large effusion in the joint. Otherwise carbolic acid would appear in the urine. It is not to be employed in hemarthroses, because it increases the clot formation which interferes with later punctures. This method should be employed in the treatment of beginning infection and particularly for the prevention of threatening joint infection. We may employ puncture with a trochar, pressing out and aspiration of the blood exudate; irrigation of the joint with a 0.5 to 1 per cent. carbolic solution or a weak Lugol solution, of which a little should be left in the joint. Adhesion formation is not to be feared in these cases of acute infection. This method is to be used in serofibrinous effusions, beginning pus formation, and in not severely infected hemarthroses. Small capsule incision, evacuation of the exudate with a glass drain in most cases for the application of the phenol-camphor treatment to the joint, is to be employed in empyemata of the joint and in severely infected hemarthroses. Wide opening of the joint, when possible in a dependent position, is to be employed in the capsule phlegmons, rich in exudate and destructive. Wider opening without damage to the joint ends, and sacrifice of important tendons and ligaments, is to be used in capsule phlegmons and total suppurations, poor in exudate. Primary typical or atypical resections are rarely done; secondary reactions more often in cases in which the infection cannot be overcome or in fractures with splintering and much damage to the joint ends.

Primary amputation or exarticulation is indicated in crushing injuries with putrid infection, gangrene of the limb, etc. Secondary amputation is done upon the recognition of the failure of the previously named methods and when life is threatened.

Treatment of Open Pneumothorax by Immediate Suture of the Thoracic Wall.—WIEWORSKI (*Zentralbl. f. Chir.*, xliii, 1005) fully agrees with Hanusa that immediate suture of the chest wound is indicated. He would not even wait until the wounded man can be brought to a field hospital, but would have him transferred to the nearest place where he could have the services of a surgeon. The technic is simple: The region surrounding the wound is thoroughly painted with iodin. The gross soiling of the wound is cleansed and the irregular shreds of tissues are cut away with scissors and splinters removed. The wound edges are then approximated by deep silk sutures, taking in the pleura. Narcosis is not necessary. Lung wounds are disregarded. Three sutures in a thoracic wound 12 cm. long will give an air-tight closure. The results in all of the cases were surprisingly good. As soon as the last suture is tied and the sound of the escaping air stops, the groans of the patient cease. The pulse becomes quiet and stronger, the dyspnea ends and the general condition improves. With large lacerations of the lungs and open pneumothorax, the lung sutures and the suturing of the lung into a window opening in the chest wall, belongs to the work of the field hospital.

Observations on the Relation of Acidosis to Anesthesia.—CALDWELL and CLEVELAND (*Surg., Gynec. and Obst.*, 1917, xxv, 22) made observations on the blood of about 120 patients, in the Presbyterian Hospital of New York, together with their acetone and diacetic acid excretion during the period of preparation, operation, and recovery. In the average case undergoing operation, not showing glycosuria, very marked ketonuria nor acidemia before operation, the degree of acidosis induced is negligible, and the choice of anesthetics, so far as the question of acidosis is concerned, is irrevelant. None of the symptoms observed in the routine postoperative course is due to the slight diminution in alkalinity of the blood and tissues, induced by the preparation, anesthesia and operation. With the exception of 1 diabetic patient with obvious severe acidosis, not 1 case in 120 showed an acidosis either from a clinical or laboratory stand-point, approaching dangerous proportions. Acetone and diacetic acid occur in the urine of a certain percentage of patients undergoing operations, and in greatly increased percentage and amounts after operations. The presence of acetone and diacetic acid apparently has no relation to the gravity of the operation or the seriousness of the pathological condition, to the length of anesthesia, nor the postoperative nausea and vomiting. No relation can be determined between the alveolar carbon dioxide tension and the acetone and diacetic elimination, neither in the untreated nor carbonate treated cases, the latter having shown acetone and diacetic acid in the presence of high blood alkalinity. Diacetic acid in the urine is not necessarily a contra-indication to operation. Women show larger percentages and amounts of acetone and diacetic acid, both before and after operation, than men.

THERAPEUTICS

UNDER THE CHARGE OF

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The Use of Foreign Protein in the Treatment of Arthritis.—Miller and Lusk (*Jour. Am. Med. Assn.*, lxvii, 2010) add to a previous communication in which they reported 24 cases of arthritis treated by intravenous injection of foreign protein. They have continued its use and now report an additional 85 cases. Somewhat smaller doses of the typhoid vaccine (from 40,000,000 to 75,000,000) were given to his patients in this series. They used proteose or pollen protini, in only a few instances, but the results obtained would indicate that, with the proper dosage, improvement similar to that observed after the use of the typhoid vaccine will take place. In the present series there were 45 cases of acute arthritis, 4 of which were gonorrheal, and the period which had elapsed from the onset ranged from two to forty-five days. Previous to coming under the authors' care 33 had been under more or less active drug treatment, usually with salicylates. Of those who had been under previous drug treatment, 29 reported that they had not improved under this treatment, and 4 had been moderately benefited. With typhoid vaccine, 29 of the 45 patients recovered promptly; that is, the pain, redness and swelling disappeared in from one to five days, and usually within from twenty-four to forty-eight hours. From one to four injections were necessary to bring about these results. Of the remaining patients, 8 showed great improvement with only some stiffness or slight pain remaining. Six showed only moderate improvement, and in 2 no benefit was derived from the treatment. Although one of these received eleven and the other thirteen injections. Nine of the patients had recurrence, 5 of those discharged as cured and 4 of those discharged as improved. Seven of these were reinjected and either recovered or showed marked improvement. It is highly probable that the number of recurrences reported is too low due to inability to follow up the cases. In the 4 acute gonorrheal cases in this series, less benefit was derived by the treatment than in those of other origin. Twelve patients with subacute arthritis in all were treated; in 10 the condition cleared up in from three to five days after from one to four injections, although in 2 of them there was still slight stiffness or soreness in one or more joints at the time the treatment was discontinued, clearing up, however, a few days later. Two showed marked improvement after two or three injections, but subsequent injections failed to bring about further improvement. Among those discharged as cured recurrences were recorded in 2; 1 of these recovering after further injection; the other patient did not return to the hospital for further treatment. Nine cases of chronic arthritis with marked acute exacerbation were treated and in 8 the acute symptoms cleared up promptly with from one to three injections. Nineteen patients with arthritis of from

a few months to several years' duration were grouped as chronic arthritis. Only those cases were selected in which there was definite evidence of activity, and ankylosis was not marked. Ten of these patients after from one to five injections showed a definite improvement, the acute tenderness and discomfort on motion was much relieved. The patient became less helpless. As a rule not all the affected joints were benefited. The results, however, were such that it would seem the treatment had been actually beneficial. Not all of these cases have been followed, but there are several in which, after the lapse of several months, the improvement has been maintained. Five showed moderate improvement, and 4 were not benefited. The maximum number of injections given any of these patients was thirteen, being given daily in the beginning and later every two or three days. In 5 patients included in this group the arthritis was apparently of gonorrheal origin, and 3 of these showed such marked improvement that they might be pronounced as cured. This is in contrast to the resistance to the treatment of the acute gonorrheal cases. One of these gonorrheal cases was of seven months' duration and for three months previous to entering the hospital the patient had been compelled to use crutches. After three injections he was able to get out of bed without assistance, and up to the present time (four months) has not had a relapse. It is the very striking results obtained in a few cases of this character which have led the authors to believe that in certain instances the results obtained cannot be equalled by any other of the present methods of treatment. The results in the cases of chronic arthritis are on the whole, however, not especially striking. The tendency to recurrence is great, not unlikely owing to the persistence of a focal infection. It is essential, therefore, that where this method of treatment is employed, it be preceded by the usual efforts first to locate and remove the focal infection. The reaction provoked by the intravenous injection of the typhoid vaccine is severe. There is always a very marked rise in temperature, and with few exceptions a marked chill. The headache as a rule is severe, and nausea of a few hours' duration is not infrequent. In 3 cases, all alcoholics, delirium developed at the height of the fever, in 1 case continuing for thirty hours. Marked dyspnea was observed in a few cases. In only 5 of their patients did Miller and Lusk deem it advisable, on account of the violence of the reaction, to discontinue the treatment after a single injection. No fatalities have occurred as a result of the treatment, but it should be borne in mind that evidence of poor cardiac power or hypertension was considered a contra-indication to the treatment and such patients were not injected. The authors say it is practically certain that the intravenous injection of typhoid vaccine has a decided effect in many cases of arthritis, especially of the acute type. Whether the intravenous use of foreign protein in typhoid and arthritis will be retained as a therapeutic measure depends largely on whether the violence of the reaction with the inconvenience and possible danger to the patient may be considered as out-weighing its beneficial results. Perhaps further investigation will show that there are other microörganisms still more active in this respect than the typhoid and perhaps having greater therapeutic value, but also giving rise most likely to even more violent toxic reactions.

PEDIATRICS

UNDER THE CHARGE OF

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The Intraperitoneal Injection of Saline Solution.—BLACKFAN and MAXCY (*Amer. Jour. Dis. Children*, January, 1918, vol. xv, No. 1) state that this method is recommended for the introduction of fluid in the treatment of the severe nutritional disorders of infants especially when, after continued vomiting and diarrhea, marked loss of body fluid results. The ordinary methods often fail because of the presence of vomiting and diarrhea. Intravenous injection is often difficult and it is rarely possible to inject a sufficient quantity without throwing too great a burden on the circulation. The authors have had little success with the subcutaneous method. The patient is placed in the recumbent position with the movements of the arms and the legs restricted by a restraining jacket. The most favorable site for the introduction of the needle is through the linea alba just below the umbilicus. The patient is prepared as for any surgical procedure. The solution is introduced by gravity. Normal salt solution at 100° F. is introduced until the abdomen is slightly distended, which requires from 100 to 250 c.c. The results are noted in a short while. A febrile reaction ranging from 100° to 101° sometimes follows this injection, but it subsides in twenty-four to forty-eight hours.

Studies of Acid Production.—SAWYER, STEVENS and BAUMANN (*Am. Jour. Dis. Children*, January, 1918, vol. xv, No. 1) say that major and minor surgical operations, infectious diseases, and diseases of the gastro-intestinal tract are accompanied by an increase of acid production. Children seem more susceptible to acidosis than adults and the authors have undertaken to prove this experimentally on a series of 10 cases. A difference in reaction toward the acid-producing diets was noted by means of the blood and urine analyses. There was also a difference in the time which elapsed before a marked response occurred. The cause of this variation was not determined. The response to the high fat diet was apparently more rapid and greater than to the low calory diet. Starvation does not always produce a marked increase of the acetone bodies in the blood of children. Prominent symptoms of acidosis may appear in less than twenty-four hours on the low calory diet. The most frequent symptoms are nausea, vomiting, drowsiness, irregularity and slowness of the pulse and an increased respiratory rate. The titratable acid of the urine, which is largely due to a preponderance of acid phosphate, increases as a result of the change in the diet before the ammonia. This is accompanied by an absolute increase in the phosphate of the urine without a compensatory decrease of the fecal output. The increased acid elimination is often followed by a period of diminished excretion and this is asso-

ciated with a similar decrease of the phosphate excretion. The increase of the ammonia excretion appears on the second day after taking the acid-producing diet and lasts for several days after the resumption of the normal diet. Creatinin is practically constant and may be used as a standard to determine the accuracy of the urine collection. Creatin is uniformly increased during the period of increased acid production, which is followed by a period of markedly diminished excretion lasting several days. While the nitrogen excretion varies within wide limits, an unmistakable rise during the period of high fat feeding is present. This increase is uniformly accompanied by an increased creatin excretion and may be due to muscle break-down. In this series during the low calory period twice the amount of nitrogen ingested was eliminated through the urine and the increased elimination during the acid period was occasionally followed by retention. In a few cases qualitative test showed the presence of aceto-acetic acid four hours after the taking of the high fat diet. The carbonate values of the plasma of the blood is a reliable index of the severity of the acidosis. The combining power appears to be inversely proportional to the sum of the titratable acid. The average normal plasma carbonate value for twelve children between the ages of four and eight years was 54 volume per cent. In a general way the increase of acetone bodies in the blood is proportional to the severity of the acidosis. The glucose content of the blood is usually decreased during the period of acidosis.

The Skin and Throat Manifestations of Heine-Medin's Disease.—REGAN (*Arch. Ped.*, December, 1917, vol. xxxiv, No. 12) believes that congestion of the throat is an almost constant symptom of poliomyelitis during the early acute stage. It is, as a rule, limited to the faucial mucosa and the pharynx, while the soft palate assumes a deep red color and often a distinct violet-like hue. The surface bloodvessels are not usually congested to any great extent. This violet-like tinge varies in degree and while not by any means typical, it is somewhat distinctive of poliomyelitis when it is marked. A mild degree of inflammation of the tonsils is very common, but follicular exudation is rare, as is also true membrane formation. The uvula often appears unusually small. The buccal mucosa varies only slightly in color. The tongue is usually heavily covered with a grayish or yellowish-white coating with the tip devoid of covering. Gingivitis is present in a small proportion of cases. Rashes are frequent especially in younger children. They appear as early as the second day or as late as the fifth week. Their average duration is about four days. In distribution they show a decided tendency to localize on the trunk, especially on the neck and chest and to a lesser degree on the back, abdomen and face. Bulbar cases rarely show an eruption, but meningitic cases are frequently associated with rashes. The most common variety of rash is the pinpoint to pin-head papular form. It is often preceded by a scarlatiniform eruption, which is usually easily differentiated from the rash of scarlet fever. True maculopapular type of rash is rare. When it does occur it is not easily confused with measles. Herpes labialis are rare. Desquamation is rather frequent.

OBSTETRICS

UNDER THE CHARGE OF

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Pregnancy following Extensive Operation upon the Tube and Ovary, with Removal of the Appendix.—VINEBERG (*American Journal of Obstetrics*) reports a case of a woman, aged twenty-six years, married twelve months, never pregnant, seen in consultation. She had pain in the left groin and fever for several days. Then the pain shifted to the right lower portion of the abdomen and again to the left side. Upon examination, the abdomen was rigid, the uterus partly retroverted, posterior vaginal vault rigid but no mass could be made out. Ten days later the patient was again seen and was no better. The pain in the right side of the abdomen was very severe. The patient was removed to hospital for operation. The uterus was retrodisplaced and adherent, as were both tubes and ovaries. On the left side the tube was inflamed, the ovary cystic and both were removed. On the right side the ovary was in fairly good condition and was left and the tube opened at its fimbriated extremity. The appendix was found high up beneath the liver in a mass the size of a hen's egg, containing adherent cecum and ileum; the appendix was gangrenous. The patient made an uneventful recovery and subsequently became pregnant.

Osteomalacia.—A case of this condition, comparatively rare in this country, is described by BAILEY (*American Journal of Obstetrics*). The patient was an Italian, married at nineteen years, who had in all thirteen children. After the birth of the eleventh, the patient could not get up when she attempted to walk, and during the next four years she became bed-ridden, with more or less constant pain in the legs, thighs and back. Her joints were not stiff, but, on attempting to walk, she had pain in the legs and extreme weakness. About two months before she again became pregnant there was some improvement. Following this pregnancy she was worse, and about two years before coming under observation both the bones of the forearm fractured while the patient was attempting to put her left arm behind her back. She received no surgical treatment, but after three months she was able to use the arm again. The patient was then for some time in the hospital and *x*-ray examination showed united fracture of the left forearm and partially united facture of the neck of the left femur. The patient then returned to her home and became much smaller in stature and fractured her left humerus in attempting to raise herself on her elbow. These fragments did not unite. She was again brought to the hospital after being in labor fourteen hours in her thirteenth pregnancy. The abdomen was greatly protuberant and the head unengaged and the patient was given an anesthetic for examination. While being placed upon the table, the right femur fractured with an audible crack. The cervix was found to be fully dilated and the fetal head above the pelvic brim. The pelvis

was beak-shaped and so deformed that the head could not descend. The child was delivered by abdominal Cesarean section and the patient finally developed, in about two weeks, a bed-sore. She was taken from the hospital against advice and subsequently died in her home. The body was obtained for examination and the entire skeleton found to be extensively diseased by osteomalacia. Among the most interesting explanations of this disease is that given by McCRUDDEN (*Arch. Int. Med.*, 1910, lv, 196 to 630) who found by experiment that calcium phosphate is greatly lessened in these cases while magnesium phosphate is increased, the organic sulphur and phosphorus being also increased. Fehling has advanced the theory that the disease is a trophoneurosis due to reflex stimulation from the ovaries. In the case reported, there was a continued drain of calcium from the patient for eleven years, during which she was either pregnant or furnishing milk for her child and exhausting her supply of calcium. There had been several efforts at recovery but these efforts were finally overcome by repeated pregnancy.

Pregnancy Complicated by Cancer of the Cervix.—ZIMMERMANN (*American Journal of Obstetrics*) among 3000 obstetrical cases in the Low Maternity of the Brooklyn Hospital, found 2 cases of cancer of the cervic complicating pregnancy. He describes the characteristic case of a multipara, aged thirty-seven years, admitted to the hospital because of intermittent vaginal hemorrhage. Menstruation had been missed for about two months, and three days before admission she had cramps in the lower abdomen and greatly increased hemorrhage. A diagnosis of threatened abortion was made. Upon examination, there was a cauliflower growth from the posterior lip. The os was patulous and the body of the uterus not very mobile, soft and about the size of a four months' pregnancy. As hemorrhage was profuse, the vagina was tightly packed with gauze. On the following morning the ovum was expelled with the packing, followed by gradual involution, but the uterus remained tender on pressure and not freely mobile and there was a small mass in the left broad ligament. The entire uterus was removed and the patient's recovery was apparently good. Within eight months she had a return and died of malignant disease involving the remaining structures of the pelvis within a year. A further case is described of a multipara in labor a little before the eighth month. When admitted to the hospital there was a hard ring about the cervix nearly one and one-half inches thick. Although uterine contractions were vigorous, the cervix did not dilate, and malignant disease was evidently present. Accordingly, the child was delivered by Cesarean section and the entire uterus then removed. The patient made a good recovery.

Bichloride of Mercury Poisoning from the Insertion of a Tablet within the Vagina.—MILLAR (*British Medical Journal*) reports the case of a woman who had been in the habit of taking vaginal douches of bichloride of mercury, who inserted a tablet containing $8\frac{3}{4}$ grains into the vagina at bed time. The patient seemed to think that this was practically the same as taking a douch. At ten o'clock the following morning she came to a physician's office complaining of pain and swelling of the vulva and told what she had done. Copious

warm douches of water were at once given and a few hours afterward severe pain began in the abdomen, with diarrhea and severe vomiting. Upon examination, the vaginal mucous membrane was practically intact but the external parts were congested and edematous. The patient grew steadily worse and died of exhaustion on the sixth day. An autopsy was obtained which showed the characteristic lesions of bichloride poisoning.

Twin Pregnancy in a Horn of a Bicornute Uterus.—SCOTT and FORMAN (*American Journal of Obstetrics*) describe the case of a multipara who became a third time pregnant when her second child was six months old. During the first four months of this pregnancy she suffered from sharp abdominal pain at irregular intervals. On one occasion the pain was so severe that an abortion was feared but did not occur. When the tenth month of pregnancy came, labor pains began and continued over a period of two weeks and subsided without the expulsion of any material from the uterus. The abdomen remained large and it was suspected that the patient had an ovarian cyst. Ten months after this a third child was born and the delivery was not unusual except for rather severe hemorrhage. Three years elapsed and then a fourth child was born, after a normal pregnancy and a normal labor. Three abortions followed the birth of this child, and nine years after the birth of the fourth child the patient again became pregnant and passed through a normal confinement. In the interval of pregnancies menstruation was regular. The abdomen of the patient remained large and she suffered occasional attacks of pain in the lower abdomen very similar to the pains of labor. These attacks gradually increased in frequency and severity, and twenty years after the uncompleted labor the patient entered the hospital for treatment. On opening the abdomen there was a large sac attached to the posterior wall of the pelvis and to the uterus. This was removed, together with the right tube and ovary which were attached to it. The patient made an uninterrupted recovery. Upon examining the sac, the bones comprising two fetal skeletons were found. On microscopic examination the smooth muscle cells were found in the wall of the sac with other tissues, indicating that the gestation sac was a portion of the uterus. Evidently this sac was one horn of a bicornute uterus and in that portion of the womb there had occurred a twin pregnancy and the skeletons of the fetuses had been retained for twenty years. During this time the patient had been pregnant several times and had been delivered of three living children.

The Operative Treatment for Stenosis of the Pylorus in Infants.—MONNIER (*Revue médicale de la Suisse romande*) has operated upon 4 infants, three, four and eight weeks old, for stenosis of the pylorus. In 1 case the child was so weakened by constant vomiting that the operation seemed a great risk. The child, however, grew immediately better and the vomiting stopped as soon as the operation was completed. None of these infants would probably have survived a more complicated operation. The method employed was that of Rammstedt, which consists in slitting lengthwise the muscular fibers of the pylorus, which are always hypertrophied in these cases. The incision leaves the mucous membrane undisturbed. There

is a separation of 2 or 3 mm. between the cut edges, which makes a gap, in the depths of which the mucous membrane can be seen protruding slightly. No sutures are applied, and occasionally a small omental flap is drawn over to the site of operation, which requires but a few moments. But a few drops of chloroform or ether, or both, are given, and the pyloric region is drawn out through a small opening above the umbilicus. The pylorus was a hard tumor resembling an almond, without any suggestion of inflammatory changes, and with an anemic surface. The incision is carried freely through the serous and muscular coats down to the mucous membrane and the cut edges separated widely, but there is scarcely any bleeding. After the operation the child must be fed very carefully, small quantities only of food being given at frequent intervals. As the child is ravenously hungry the temptation is to give too much. When feeding is limited or when a wet-nurse can be obtained the results are usually very satisfactory.

The Umbilical Cord as a Factor in Infant Mortality.—YOUNG (*American Journal of Obstetrics*) calls attention to the part played by the umbilical cord in producing the death of the infant during gestation and at birth. During gestation, knotting of the cord may cause the death of the fetus at any time. At the time of birth the cord is frequently around the neck, and the importance of this condition depends upon its length and elasticity, the number of coils, and the placental implantation. This coiling of the cord is furthered by unusual activity in the fetus. The condition may be inferred during labor if the head is imperfectly flexed and withdrawn between the pains. If there is shock during pains or symptoms of hemorrhage through placental separation the diagnosis is suggested. The largest number of coils reported about the neck of the child is eight, and if the life of the child is to be saved, immediate delivery by Cesarean section must be considered. A case is described of a primipara, with normal pelvis, who had premature rupture of the membranes and slow labor. Pituitrin was given twice. The head engaged, but between the pains receded very noticeably and shock developed during pains. The patient was delivered with difficulty by forceps and seemed much shocked during the operation. The child was dead, the cord was three times about the neck and pulled to an exsanguinated rope, a noose being formed by the cord. The placenta was attached at the fundus on the posterior wall of the uterus. The cord measured 106.5 cm. Had Cesarean section been employed promptly the child's life might have been saved. In discussion, Barclay drew attention to the fact that a short umbilical cord is rare. The records of the last year at the Maternity of the Manhatten Hospital show but 5 short cords, of which the shortest was 37 cm. in length. Of these only 3 made complications during labor. In 3 instances the condition was recognized before delivery, in which case the child was delivered and the cord torn off 0.5 cm. from the imbilical ring. There was profuse hemorrhage, which was stopped by circular purse-string sutures. In another case the head was on the vulva and receded to an abnormal extent in the interval between pains, and from this the diagnosis was made. In still another there were 2 coils of the cord around the neck. The cord was cut and the child delivered. The cord measured 45 cm. in length. In this case the cord was both short and wrapped about the child's neck, and during delivery the placenta was detached, followed by sharp hemorrhage.

GYNECOLOGY

UNDER THE CHARGE OF
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Results of Radium Treatment in Cancer.—As a result of the use of about 235 mg. of radium in the treatment of 642 cases of cancer and allied conditions at the Collis P. Huntington Memorial Hospital from September, 1913, to January, 1916, DUANE and GREENOUGH (*Boston Med. and Surg. Jour.*, 1917, clxxvii, 359) believe that the following conclusions are justified: (1) Many cases of advanced, inoperable, or recurrent cancer may be given benefit by treatment with radium. (2) In such cases the relief may include one or more of the following advantages—relief of pain, diminution of discharge, rendering discharges less offensive, relief of hemorrhage, diminution in the size of the tumor masses, even to their total disappearance, and the improvement in the general condition of the patient. To these must be added the undoubtedly beneficial psychic effect upon the patient. (3) In a very small number of advanced and apparently inoperable cases, improvement may occur such as to permit a radical operation to be performed. (4) In a certain proportion of cases of superficial non-metastasizing types of cancer (about 35 per cent.) and in a much smaller number of cases of metastasizing cancer, radium is capable of destroying the clinical manifestations of the disease. Sufficient time has not elapsed to report these cases as cured, and they are being kept under observation. In a limited number of cases, recurrence, after apparent destruction of the lesion, has taken place. (5) In keratoses, papillomata, and other benign skin diseases regarded as "precancerous," radium is effective in destroying the clinical manifestations of the disease in from 48 to 60 per cent. of cases. In the treatment of many tumors and diseases radium has been used with benefit, depending largely upon the extent of the disease, its depth in the tissues and the practical ability to apply sufficient radiation to modify or destroy tissue or tumor growth. The use of radium in prophylaxis of recurrence after radical operation for the cure of cancer is not advised by these investigators. When serious doubt exists as to the complete removal of the primary tumor and when the location of the suspicious area is superficial and accessible and of small extent, radium may be used with benefit; but when a large area is to be considered, as after an operation for cancer of the breast, the difficulties of covering the whole area with sufficient radiation are such that the treatment is not to be recommended. Of the 642 cases of cancer of all types in this series that were treated with radium, 354, or 55 per cent., received definite benefit. Although many cases of advanced carcinoma show no appreciable benefit from radium treatment, on the other hand, in no case in this series did radium appear to have accelerated the growth of the tumor tissue. Of the detailed report of individual types of cases treated that accompanies this article, we shall concern ourselves merely with that part of it that embraces the female generative organs: *Vagina:* 4 cases of cancer of the vagina

received radium treatment. They are all dead, the average duration of life being six months, from the onset of treatment. *Vulva:* 2 cases and also 1 case of cancer of the clitoris, none of which showed any benefit from the treatment. *Uterus:* these cases have been classified as follows: Group 1. Cases considered inoperable and treated with radium which improved enough to justify later radical operation; 5 cases, 3 living, 2 of which are without recurrence at twelve and eighteen months after operation and 1 case free from recurrence for two years after operation, when a local recurrence appeared and the case is now under treatment. Group 2. Cases given prophylactic treatment following a radical hysterectomy; 5 cases, 2 free from recurrence at twelve and fifteen months after operation, 2 recurrent cases and 1 case untraced but free from recurrence eight months after operation. Group 3. Recurrence after hysterectomy; 37 cases, 1 apparently free from the disease, 2 doubtful, 5 living with recurrences while the remaining 29 are dead. Group 4. Recurrence after the use of the curette and cautery; 21 cases, 4 living with recurrence and under treatment, 1 living and without evidence of disease nineteen months after beginning treatment, but since then untraced. Group 5. Inoperable cases; 22 cases, none free from disease, average duration of life after beginning radium treatment was twenty-two months. Of the total 90 cases of carcinoma of the uterus, 7 cases are living and apparently free from disease at periods varying from six to nineteen months after operation, 2 of these cases being treated on a prophylactic basis while the other 5 were recurrent or inoperable cases. *Ovary:* 5 cases of carcinoma of the ovary received radium treatment. Of these, 1 case showed temporary improvement but died fifteen months after beginning treatment. The other cases showed no marked improvement under radium. In connection with the foregoing article it is interesting to note that Boggs (*Am. Jour. Roentgen.*, 1917, iv, 207) states that experience of the past few years has shown that we cannot treat successfully with radium at a greater distance than 2 or a maximum 3 cm. It has been universally accepted that cancerous growths can be promptly and also apparently permanently cured at this depth from the radium tube. However, if the disease is advanced and there is infiltration of the growth into adjacent lymphatics the cure is only apparent. The local growth may disappear, but if metastasis takes place before treatment is given it will progress without regard to the quantity of radium applied or to the length of time it is applied.

PATHOLOGY AND BACTERIOLOGY

UNDER THE CHARGE OF

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Reaction of the Spleen in Acute Infections.—The reactions in the spleen under various conditions of disease have always been difficult of interpretation. Much of this difficulty lies in the lack of a clear

conception of the function of the spleen as an organ, as well as in the lack of knowledge concerning the activities of the individual portion of its tissues. This ignorance permits of wide speculation on the part of many observers, a feature which has been taken advantage of by not a few advancing hypotheses difficult of proving or disproving. As is pointed out by EVANS (*Johns Hopkins Hospital Bulletin*, xxvii, 356) there is no thorough agreement upon the nature of the various cell elements present in the normal spleen. To what extent the spleen pulp is active as a hemopoietic organ, what is the nature of the large endothelial cell of the sinuses and what is the relationship between the endothelial cell of the Malpighian body, of the vascular spaces, and of histogenous origin, are questions which require further study. Evans has made a study of the splenic tissues under conditions of various infections. He points out that the reactions may be broadly grouped into two classes of splenic enlargement: (1) with red pulp substance; (2) with gray pulp substance. It is interesting that these groups are fairly sharply defined by the nature of the infection. The red type of the reaction is an acute splenitis found particularly in typhoid fever and its allied diseases; the gray variety is associated with infections by the pneumococcus, staphylococcus and the various streptococci. These splenic reactions are to be recognized in the gross, the red variety being the large spleen with tense capsule and soft, almost diffluent pulp. In it the Malpighian bodies are obliterated. The gray variety shows moderate enlargement with a pulp substance which, though soft, is never diffluent. The pinkish-gray color is uniformly diffused through the tissue and the Malpighian bodies are not to be seen. The types are also distinct on histological examination. The reaction in the red variety consists mainly of engorgement of the splenic sinuses accompanied by a hyperplasia of the endothelial cells of the pulp. In the gray variety more or less congestion may be present but the tissue reaction is distinctly different from the above. In place of the endothelial proliferation of the pulp there is an accumulation of polymorphonuclear leukocytes and other oxydase-containing cells as well as a fair number of lymphocytes. To observe the more or less specific splenic response to particular infections, Evans studied the spleen of rabbits inoculated with a variety of B. typhi murium and the pneumococcus. Although the reactions were not so prominent and individual as they are in man, a similarity in the reaction was nevertheless observed. The author points out that although the two types of splenic tumor appear quite distinctive, it is not to be inferred that single varieties of cell elements alone respond in either.

The Oxidizing Ferment of the Myelocyte Series of Cells and its Demonstration by an Alphanaphthol-pyronin Method.—Classifications of the white cells of the blood we have in plenty. The difficulty which confronts the microscopists is the certain recognition of the cells belonging to individual groups. It is true that under normal conditions or common pathological states this difficulty is not so great, but in certain blood diseases the classification of the cells appearing in the blood stream is no easy matter. By the ordinary methods of staining there is little opportunity to indicate the exact nature of the cells spoken of as

myeloblasts and their differentiation from lymphogenous cells is not certain. It has been shown by Winckler, Brandenberg and others that lymphocytes and their accestral cells are devoid of oxidizing ferments while the cells of myelogenous origin commonly contain it. However, even at the present time it is not clear whether the cells in all stages in the development of leukocytes are oxydase-containing. Nevertheless a positive reaction for oxydase within white cells of the blood is accepted as sufficient evidence for excluding them from the lymphogenous series. Various reagents have been used for this demonstration of this intracellular ferment. The guaiac test has been replaced by a more precise method whereby indophenol resulted from the interaction of oxydase upon alphanaphthol and dimethylparaphenylenediamine. This latter method has been in common use and has given, as demonstrated in the work of Evans, a new understanding to many cells in the circulation and in the hemopoietic organs under pathological conditions. One difficulty in making use of the diamine test has been in the transient nature of the reaction. The coloration of the oxydase granules is best observed within a few minutes after the application of the test solutions, from which time a rapid fading takes place. Furthermore, the diamine compound is very expensive and when made up in solution for use, lasts only a few days. GRAHAM (*Jour. Med. Res.*, xxxv, 231) has brought forward an excellent and inexpensive substitute for the demonstration of oxydase granules. He has tested his method upon blood smears as well as upon formalin-fixed tissues. The results have been very satisfactory. By this method the cells are treated with an old solution of alphanaphthol (or by a solution ripened with hydrogen peroxide) and after washing are then stained with an aniline-pyronin solution. The oxydase granules are sharply differentiated by the pyronin staining and are quite permanent. This new method should find a wide application and permit of a better classification of the indefinite white cells of the blood.

The Etiology of Scarlet Fever.—MALLORY and MEDLAR (*Jour. Med. Res.*, xxxv, 209) have found a microörganism in association with pathological changes of the respiratory tract in scarlet fever, which they believe is of etiological significance. The microörganism is a Gram-positive bacillus belonging to the indefinite diphtheroid group. The exact biological characteristics of the organism for comparison with other members of this group have, as yet, not been determined. The bacillus was isolated from the faucial tissues in 5 cases of scarlet fever. No conclusive results were obtained by means of the complement-fixation test nor by animal experiment by the use of this microörganism. The authors place much importance upon the presence of morphologically similar organisms present upon the epithelial surfaces of the pharynx and respiratory tract in cases dead of scarlet fever. They do not, however, make any positive claim for this organism as the cause of scarlet fever.

Primary Carcinoma of the Ureter.—SCHMITT (*Jour. Cancer Research*, i, 461) has collected all the undoubted cases of primary carcinoma of the ureter, beginning with the first reported by Wising and Blix in 1878. Spies, in 1915, published a very complete review including

benign and malignant tumors of both kidney and ureter. The author however. is able to add 3 other cases, besides the 1 he reports in detail, making a total of 20 cases now recorded in the literature. The condition is one seen after early adult life. The sexes appear to be equally affected. The diagnosis is rarely made clinically, since the symptoms come on very gradually. The presence of a painless abdominal tumor the author states, has most often led to a diagnosis of hydronephrosis due to ureteral obstruction. Pain, which may be severe, is a late manifestation, and in its absence a tentative diagnosis of neoplasm has sometimes been made. The author's case might be called a typical one, as it corresponds in general with the others, whose histories are briefly given. The patient was a female, aged fifty-eight years. The chief complaint was diffuse pain in the abdomen, especially low, in the left iliac region. There was a history of persistent constipation suggesting intestinal obstruction. A little over two months after admission and three and a half months after the onset of her illness, the patient died. Autopsy revealed many dense abdominal adhesions between the viscera and the abdominal wall. In the upper left abdomen there was a large retroperitoneal mass to which the jejunum was adherent in a sharply kinked position. The mass appeared to have some relation to the kidney. Other autopsy findings aside from metastases were of interest but rather unimportant. The neoplastic mass was firmly adherent to the abdominal wall, and to the vertebral column from the eleventh dorsal to the third lumbar vertebra. It was cystic, containing cloudy fluid and necrotic débris. The body of the third lumbar vertebra had almost been destroyed by the newgrowth, which also infiltrated the psoas muscle. The cavity of the tumor measured 10 x 10 x 15 cm., and its wall averaged 2 or 3 cm. in thickness. The wall consisted of a friable pink tissue on a firm white base. The upper boundary of the mass was higher than the upper end of the ureter. The occlusion of the ureter by the growth had led to a dilatation of the renal pelvis. The lower extremity was continuous with the ureter, which could be followed as a solid cord for a distance of 3 cm. into the mass. Below this point the ureter was normal. Sections showed the tumor to be a primary cancer of the ureter, further described as of the transitional cell variety. Metastases were found in the portal channels of the liver, beneath the capsule of the left kidney, and in the bodies of several vertebræ. The lung and liver, it may be noted, are the usual sites of secondary growth in tumors of this sort. The relation of calculi to carcinoma of the ureter is mentioned in this connection, but a definite suggestion as to the etiology is not made.

Experimental Typhoid Cholecystitis with Cholelithiasis.—The importance of a typhoid infection locating in the gall-bladder is by no means new. It has been brought to our attention through the finding of the typhoid bacillus in the gall-bladder in virtually every case of typhoid fever, and also in the evidence that human carriers of this infection possess an infected nidus in this viscus. Furthermore, there is evidence that not a few of the cases of chronic cholecystitis have their beginning in typhoid fever. The association of gall-stones with these chronic inflammatory processes of the gall-bladder is also well known and has been shown to have a direct relation with a typhoid infection.

EMMERICH and WAGNER (*Centralbl. f. Allgem. Path.*, xxvii, 433) carried out a series of experiments in which the results strongly confirm the observations made in the human. They immunized rabbits, by means of vaccines, against the B. typhosus. These animals were then inoculated with living cultures directly into the gall-bladder. Observations were made upon these animals during a period of eighteen months and, by the examination of individual rabbits at various periods, the sequence of pathological changes in the gall-bladder was observed. Various grades of inflammation were observed, the most interesting being those in the later months when chronic processes became evident. Fibrosis of the gall-bladder with destructive or hyperplastic reactions in the mucosa associated with a shrinkage of the wall, were very similar to the lesions seen in human cholecystitis. The curious overgrowth of the glandular elements of the mucosa frequently appearing to invade the deeper submucosa is noteworthy. In a fair number of the animals there was the development of gall-stones consisting mainly of pigment deposit. The stones were multiple and of irregular size and shape. They contained relatively little cholesterin. The majority of animals also became chronic carriers, so the B. typhosus could be isolated from the stools or intestinal contents.

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DIRECTOR OF HYGIENIC LABORATORY, UNITED STATES PUBLIC HEALTH SERVICE, WASHINGTON, D. C.

Health of Food Handlers.—HARRIS and DUBLIN (*Monograph Series*, No. 17, Department of Health, New York City) report the result of intensive examination of 1748 food handlers examined at the Occupational Clinic during 1915 and 1916. These intensive examinations were made possible by the coöperation of the American Museum of Safety, and are typical for the entire number of food handlers, 44,042 examined at the Clinic and 33,000 by private physicians during the same period. The results of the examinations were classified, tabulated, and analyzed by Dr. L. I. Dublin, statistician of the Metropolitan Life Insurance Company. The 1748 food handlers represented the following occupations: Waiters, 695 persons; waitresses, 211 persons; cooks, male, 278 persons; cooks, female, 110 persons; other kitchen employees, 180 persons; bakers, 274 persons; total, 1748 persons. The conditions found were as follows: In the entire group there were 10 cases of active tuberculosis, 12 of suspected, and 3 arrested tuberculosis. Among waiters

were found 5 positive and 2 suspected cases; 41 persons gave evidence of active or suspected syphilis, of which 37 occurred among waiters. This group furnished 46 individuals with flat feet and a similar number with varicose veins. Among waitresses, of whom 211 were examined, 65.8 per cent. showed anemia and 62 per cent. had varicose veins; 17.1 per cent. were reported as suffering from some form of menstrual disturbance. Four waitresses were discovered to have syphilis. The predominating defect among cooks was organic heart disease. There were 32 who showed cardiac disease. In addition, also, 1 active, 1 arrested, and 2 suspected cases of tuberculosis and also 1 active and 5 suspected cases of syphilis were found. Of these cooks 161 had very marked disturbance of the digestive functions. Among bakers no tuberculosis or active syphilis was demonstrated, but 38 cases of chronic bronchial conditions, consisting of 9 chronic bronchitis and 29 pulmonary emphysema; 30 had organic heart disease and 33 anemia. The importance of the examination of food handlers is shown both from the stand-point of protection of the health of the community and opportunity of studying in occupational groups, the preventing of disease, and in order to discover incipient pathological conditions that would otherwise make great progress before being discovered. Finally, it is shown that the lack of uniformity in clinic standards and methods of classification makes the reports that have thus far been published by others working in the field of industrial hygiene less valuable than would be if such uniformity were present.

Experiences with the Louse Nuisance.—HASE (*Zentralblatt Bakt.*, Part 1, p. 153) reports the following: One year of warfare has elapsed and much of interest has been learned with reference to body lice. There are persons who acquire immunity to the painful sensation caused by the bite of the parasite. Some persons are not attacked at all, some are hypersensitive, and some acquire immunity to the bite gradually. This explains the fact that the greater part of the population of Russian Poland is indifferent to the louse nuisance. It appears that a subject which is immune to louse bites is not immune to the bites of other parasites such as bed-bugs, fleas, and mosquitoes. Of all commercial preparations sold for the purpose of destroying lice not one has been found to be of real lasting value. Many of these preparations are highly odorous and some are indeed dangerous. The author cites an interesting list of not less than 181 proposed remedies. One called "Insectol" is advertised as being of particular value and calls for the ingestion of pills containing milk-sugar and the extract of the parasite. The assertion often made that those who are constantly handling horses are free from lice has not been verified. Profusely sweating individuals do not seem to be more affected than scantily sweating individuals. Of peculiar interest is also the observation that lice will shun an old dirty shirt and underwear saturated with prespiration while they seem readily attracted by fresh and clean fabric. Apparently the high temperature and humidity of the air between the body and the fabric do not seem to agree well with the parasite. A louse will always look for the cooler parts of the clothing. The soldiers claim that the lice made themselves much more obnoxious while the soldiers were at rest and comparatively cool. It has also been noted that the number of lice is

much more diminished in trenches where ants were plentiful. Soldiers took advantage of this observation by placing their shirts upon the ant hills. The author discusses briefly the factors which are essential to prevent the spread of the louse nuisance among soldiers. It is a very difficult and tedious procedure to free trenches of lice.

The Present Status of Birth Registration in American Cities and its Relation to the Infant Mortality Rate.—DUBLIN (*Tr. Seventh Annual Meeting of the American Association for the Study and Prevention of Infant Mortality*) presents the results of an inquiry into the completeness of birth registration in American cities in the years 1910 to 1915. He received reports from 168 cities and to these applied certain tests intended to measure the accuracy and completeness of birth registration. Of the cities reporting many had fewer births than the population under one year of age and a considerable number had a birth-rate much lower than could be expected in any normal American community having anything like complete birth registration. The birth-rates for many of the cities varied markedly from the average for all—a variation than can be explained only on the basis of incomplete birth registration. On the other hand, the birth-rate in a considerable number of the cities increased markedly during the period under consideration, thus showing that the proportion of births registered was increasing from year to year. Few can doubt in the face of the figures presented that birth registration in most American States and cities is wofully inadequate. The writer then shows how the conditions of birth registration in any community affects the infant mortality rate. Since this rate is based on the proportion of infant deaths to 1000 births, incomplete registration of births makes the rate too high. It also makes it impossibe to compare the infant mortality rates for different cities in which the proportion of births registered varies. An increase in the proportion of births registered from year to year may also produce an apparent decline in the infant mortality rate even though the actual status of infant mortality remains the same. The writer shows how the supposed recent decrease in infant mortality in some of the cities studied is in reality the result of an increase in the proportion of births registered from year to year. He feels that in infant welfare work attention for the next few years should be concentrated on the problem of birth registration. "We should work to establish a registration area for births which will be nation-wide and as accurate as it is extensive."

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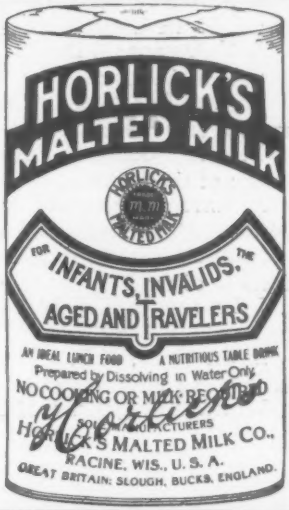
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TABLE OF CONTENTS

Diseases of the Thyroid and Thymus.
Physiology of the Thyroid.
Biological Chemistry.
Pathology.
Inflammations of the Thyroid.
Anatomopathological Relations of Goiter to the Surrounding Structures.
Clinical Symptoms and Diagnosis.
Intrathoracic Goiter.
Goiter Death.
Circular Goiter.
Congenital Goiter and Goiter in Children.
Simple Goiter and Pregnancy.
Clinical Aspect of Malignant Goiters.
Pathology of the Various Forms of Thyroid Insufficiency.
Congenital Athyroidism, Spontaneous Infantile Hypothyroidism, and Cretinism.
Small Thyroid Insufficiency.
Etiology of Endemic Goiter and Cretinism.
Medical Treatment of Simple Goiter.
Thyroid Grafting.
Indications for Operation in Simple Goiter.
Cardiovascular Symptoms.
Basedow Struma.
Ocular Symptoms.
Muscular Symptoms.
Nervous and Mental Symptoms in Basedow's Disease.
Digestive Disturbances.
Genital Disturbances.
Respiratory Disturbances.
Sensory Disturbances and Insomnia.
Cutaneous Symptoms.
Blood Changes in Basedow's Disease.
Disturbances in Metabolism.
Fruste Forms of Hyperthyroidism or Small Hyperthyroidism.
Hyperthyroidism and Hypothyroidism.
Infantile and Juvenile Hyperthyroidism.
Exophthalmic Goiter in Pregnancy.
Etiology of Graves' Disease.
Treatment of Graves' Disease.
Indications and Contraindications for Surgical Treatment of Exophthalmic Goiter.
Surgical Technic of Operations upon the Thyroid Gland.
Operative Technic for Thyroidectomy.
Operative Accidents.
Sympathectomy.
Canthorraphy.
Boiling-water Injections.
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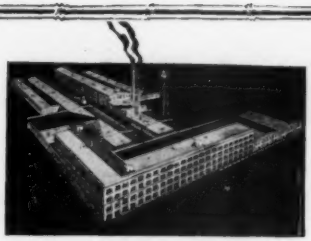

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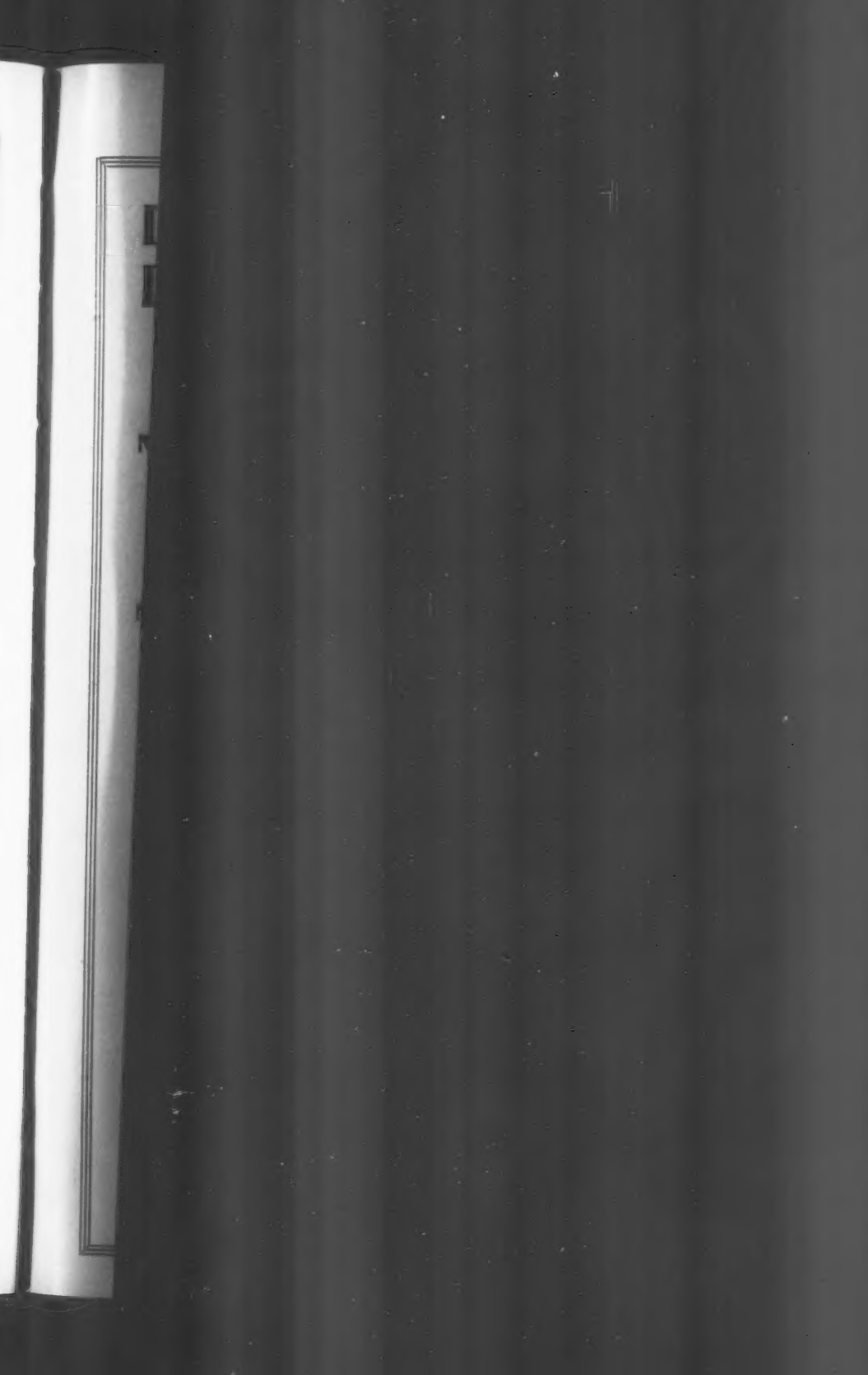

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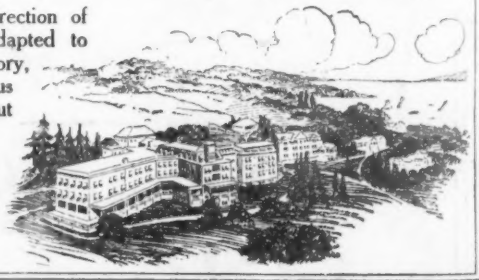
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